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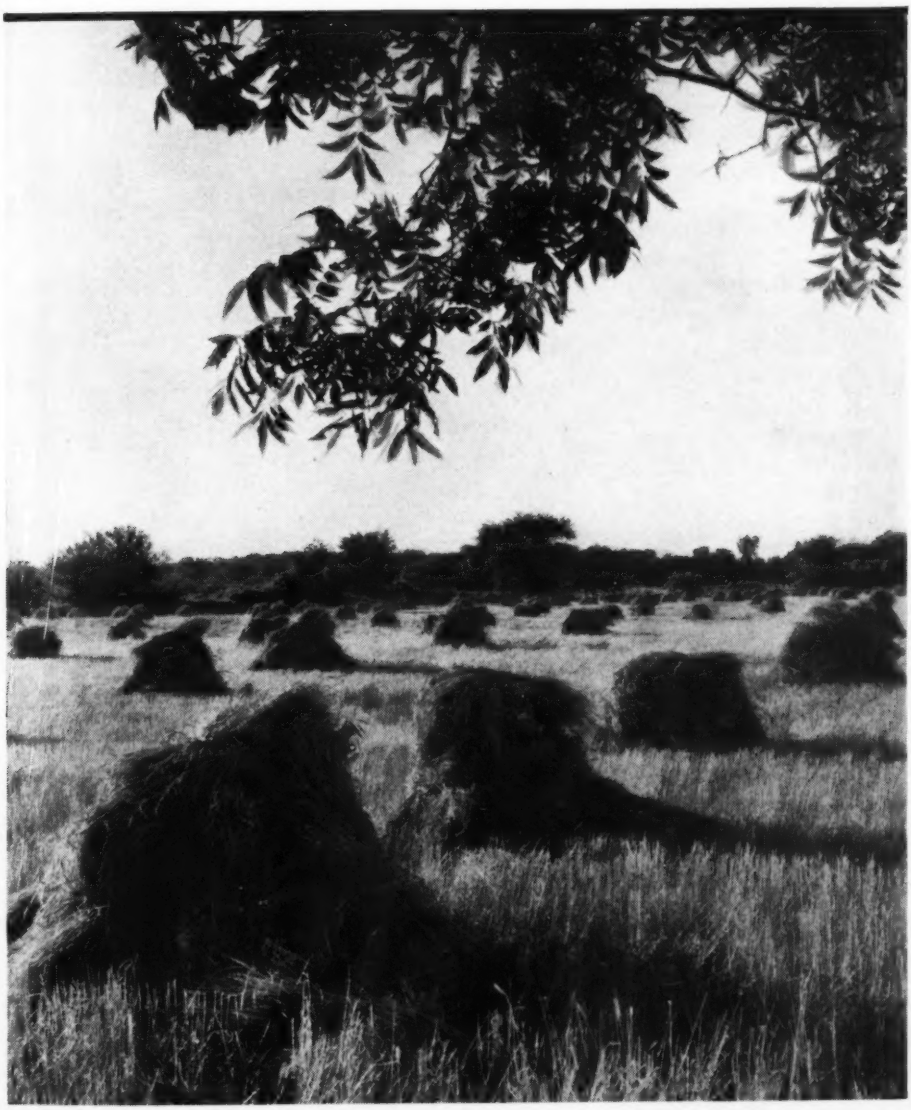

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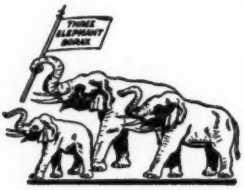

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VOLUME XXVII NUMBER 6

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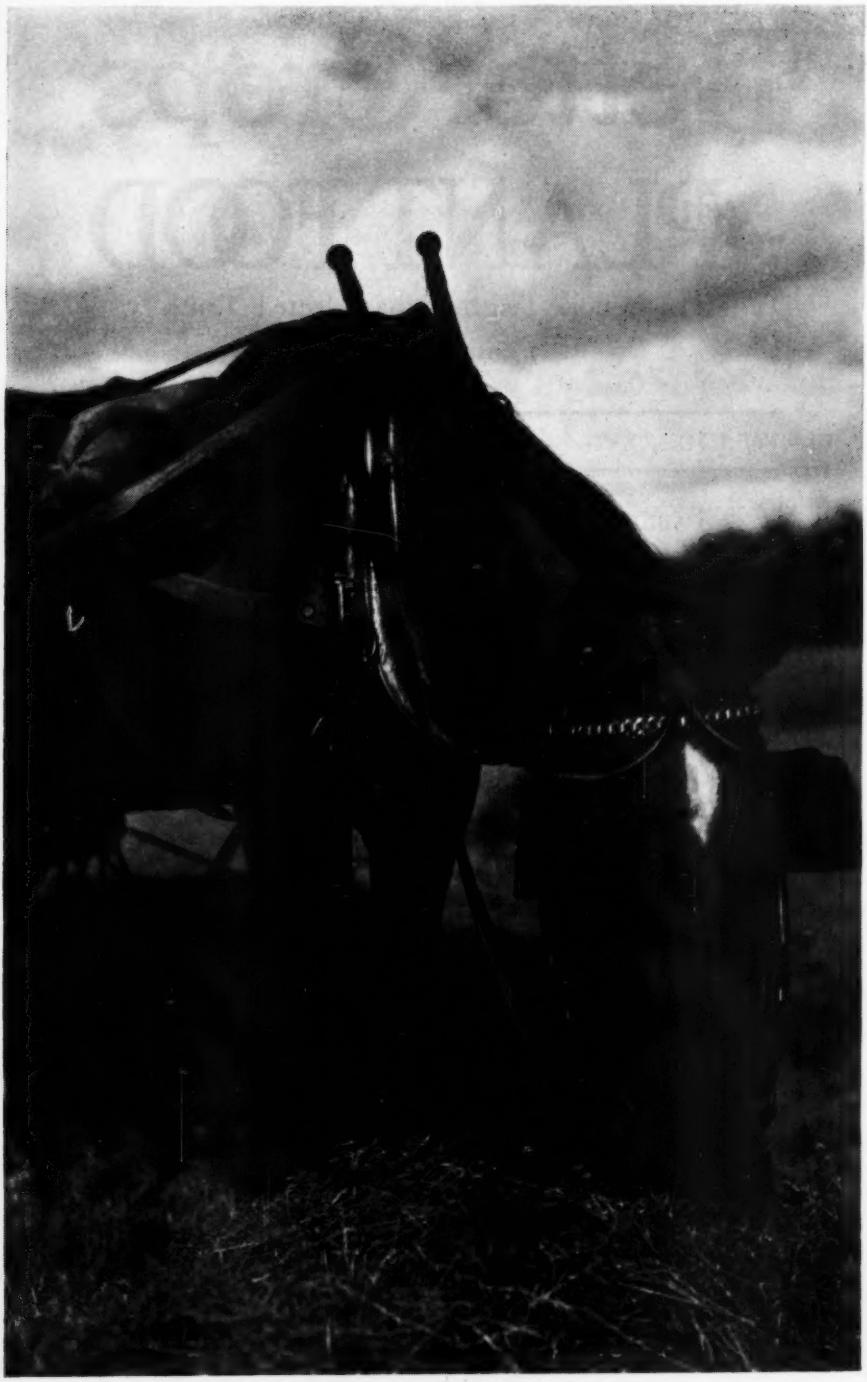

A "SNACK IN BETWEEN" EASES MANY A LONG DAY.

Better Crops with PLANT FOOD

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VOL. XXVII WASHINGTON, D. C., JUNE-JULY, 1943 No. 6

In Retrospect of . . . .

An Era's End

Jeff McDermid

NOSTALGIA may be nonsensical, but I expect that as long as men have memories one can expect a little indulgence of that kind on the sly. So let's hit the pipe and dream backwards, despite the tanks and taxes.

Subtract three decades from 1943. What you have left on the old scribble pad is 1913. That year of A. D. spells "ancient dominoes" to most of the young huskies who are too busy with history in the making to pause and ponder about a yellow leaf of yesterday.

But to me and to hosts of my befuddled generation, that year 1913 marks what seems now to have been the last lap of an era which vanished in the smoke screen set up by the conflict of 1914-18.

To us who have doubled our years of life since that way-back summer, the comparative simplicity and tranquility of existence in the two preceding decades our youth of that day had known are as hard to visualize as the rigorous reality which the coming peace must bring.

Though Congress may disagree with them, we must admit while we have our hair down that the economists were not so far off the beam when they assigned 1913 as the last year in a cycle of seasons used to figure farm parity price and income formulas.

So in attempting to value the circumstances surrounding us older "bewilderites" in relation to 1913, and why it seems significant to us in retrospect, let's blend a little of the personal along with the political and philosophical. Personal whims don't mean much any more, but they do sort of humanize both ancient and current history.

The only strange thing about it is that I can peer over the experts' slide

rules and tabulating machines and find more interesting things than dull digits in a review of that "golden age" of agriculture, so rudely and completely shattered by "repercussions" of world events since 1913.

Probably I wasn't the only chap who secured his first paying job and pocketed his first steady wages in that almost forgotten summer of 1913. Anyhow, we bade good-bye to a lot of twisting, aimless, barefoot trails and swimming-hole day dreaming that year, and gave ourselves with buoyant hope to the pursuit of success according to all the dictates of copy-books and embroidered wall mottoes.

TO be sure, there were Get-Rich-Quick Wallingfords going the rounds in magazine stories those days, but they did not blot out for us the earlier Pluck and Luck and Do and Dare series so smudgy with thumb prints in the town's circulating library. Although we were not anxious to become little Rollos or Lord Fauntleroys, in spite of well-meaning mothers, our vision of personal achievement held a decidedly vigorous and virtuous tone, with a little touch of crusading in our commercialism, while it lasted.

To be good for something was better than just being good, but nevertheless we did have a code of standards just the same, and kept it handy as long as we could.

Our whole state did not boast one single economist that summer, or he might have raised a feeble voice to warn us that "world forces were shaping our destiny" or that those few throbbing autumn days ahead of us that season would usher in a hard killing frost to nip the last fruits of "laissez faire" from the oft-shaken plum tree.

But we wouldn't have known what such fancy words meant anyhow. We only read the old North American Review to bone up on school debates, and we skipped the words we couldn't pronounce. In fact, none but a few scholarly savants used the phrase until the dollar doldrums came creeping over us in the wake of the war. All we knew or thought about in that happy summer was the security of a stipend, the society of our friends, and the open road to somewhere which youth found landmarked with cock-sure direction signs put up by former successful travelers.

My first away-from-home job was connected with the publication of experiment station circulars, which turned my embryonic imagination into channels that have since become either streams of habit or eddies of uncertainty.

Like the vocation of farming as it was then followed by neighbors we knew, the original station circulars were not garnished with literary and graphic appetizers, to make them easily swallowed and pleasantly digested. The only diversions in the educational field known to the farm craft in those days were winter institutes and summer plowing matches. When you got a sober covered circular from the experiment farm, it was classed with the almanac and the Bible, but it lacked the corny humor of the former or the circulation power of the latter. But farm life was hard anyhow, and you couldn't expect to have it alleviated by a mere editorial spasm or two.

IN scanning the agricultural background of 1913, we find it blessed with more than its normal desideratum of democracy—the Democratic Party being at the helm of state. David H. Houston of Missouri (no dirt farmer) was Secretary of Agriculture in Woodrow Wilson's cabinet. However, no untoward signs of paternalism were manifest in the doings and doctrines emanating from that comparatively tiny bureau housed in some rambling red brick buildings that would not do for a janitor's annex today.

Indeed the only form of "farm relief" on the horizon that summer (aside from more and bigger bulletins and thicker packets of free seeds) did not come from the Houston bureau at all, but bulged out as a fight for a nobler

use of the infant parcel post on the R. F. D.—and was led by a scrappy Texan, Albert Burleson, then Postmaster General in the gloomy old towered edifice so long a landmark on Pennsylvania Avenue. The "cause" had something to do with giving remote farmers a chance to get or send packets of merchandise weighing up to twenty pounds by parcel post without buying special kinds of stamps to affix on them.

Oh, sure, the rural mail was the big event of those days! It was the main avenue for covering distance and keeping in touch with fads, fashions, and fundamentals. The big department store catalogs were cluttering up the sitting room and the overland salesmen and country storekeepers were doing their darndest to keep the government from bankruptcy through serving as errand boys for city slickers with something to sell by mail. But the masses clung to dollar-saving schemes and boosted Burleson's program.

Nothing more serious than this occupied the rural forums of 1913. We were blissfully unaware of any portentous troubles of an international kind, and our main concern was to take part in just such purely domestic squabbles. Maybe they were a part of the four freedoms or self-determination, but we did not call them that.

The climatic vagaries of 1913 remind us a little of present weather behavior. The season started late, and it was very wet until June. After that it turned hot and dry and the whole Southwest was under a long siege of drought. Yet when they counted up the score at harvest time, the national corn crop exceeded two billion bushels, and at the average price of seventy cents a bushel then current, it proved to be the most valuable maize storage that the country had known to date.

In May 1913, wheat brought 93 cents for No. 2 northern; hogs at Chicago were about $8.50; creamery extra butter stood at 28 cents a pound; American cheese was 14 cents wholesale; and take due note—draft horses brought $235 to $300 for medium weights and ordinary farm chunks were quoted at $150 to $215 each.

The country was keenly awake to a real meat shortage that season, too. The agricultural leaders were much concerned about the drop in livestock production for slaughter, and one proposal asked for municipal abattoirs. Others wanted boys' pig clubs to be started, and still others supported the rather new and novel cooperative livestock shipping associations to displace the country stock buyer in the local market. One big reason for this was that Argentina had supplanted the United States as the chief European provision-supplier of fresh and cured meats. The velvet had gone from the huge export trade abroad, and nothing much had been done to stimulate and regulate the meat production and distribution system here at home to take up the slack. Hindsight was again better than foresight, a common failure in our diplomacy and planning.

Because of failure of the meat industry to keep step with home demand in the decade between 1903-13, the old Chicago International set up special boosting exhibits that winter to coax more life into the sirloin and pork-chop trade.

FOR about the fourth time in succession, it was noted that the heavy end of the premiums awarded to beef steers at this index show were placed on yearlings and baby beef calves. "The

(*Turn to page* 50)

The beets in the foreground received 900 lbs. of 0-8-24 per acre; those beyond the first stakes, the same plus 1,000 lbs. of salt; beyond the second stakes, 0-8-48; and beyond the third, the 0-8-24 with 500 lbs. of salt.

Salt With Potash For Some Crops

By Paul M. Harmer
Professor of Soils, Michigan State College

I CAN well remember when, as a youngster, I was told that in the solution of a problem which required considerable diplomacy it was sometimes necessary to "salt the cow to catch the calf." Later on came the advice that instead of "swallowing a statement, hook, line, and sinker," it was frequently advisable to take that statement "with salt." I didn't realize then that it would ever be necessary to "salt a crop to catch a good yield." When, many years later, the first sugar beet institute was held at Michigan State College in the winter of 1923-24, I was surprised by the argument advanced by one farmer from the "thumb" district in Michigan regarding the benefits which he had been securing from the use of salt on his sugar beet crop. The audience took his statement "with a great deal of salt." In fact, the response he received bordered on ridicule.

The thought occurred to me during that discussion that if there should be any basis for his argument, the benefits which would be secured ought to be considerably greater on muck soil than on the mineral soil which he was farming. This should be true especially if the benefits were due to the sodium in the salt, since the sodium content of organic soil is very small. The result of this chance discussion was that in the spring of 1924 I laid out a set of plots on our muck experimental field near East Lansing in which salt was used with phosphate alone, and as a

supplement to the regular potash and phosphate fertilization. These same plots were continued each year to the fall of 1930, and during this time some striking results were secured. Some crops showed a marked benefit from salt, but only when applied with potash, while others were not affected at all by the inclusion of salt in the fertilization.

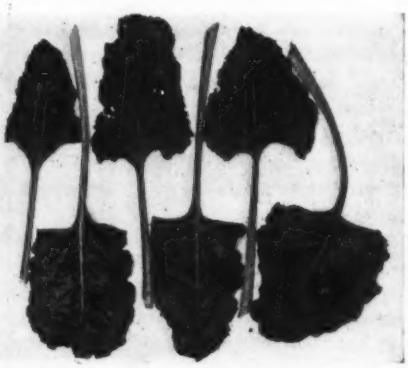
With the transfer of our central experimental plots on muck soil to a muck area on the College farm at East Lansing in 1931, the study with salt was discontinued for a year, but new plots were laid out in 1932. This muck had been broken once previous to the breaking in 1930, but had been used as pasture for the College herd for many years. These plots were an enlargement of the first set in that the treatments included the use of 20 per cent imported kainite as a source of potash, included because the chief impurity of kainite is sodium chloride. The plots were continued until the fall of 1941. In the spring of 1942 the salt study was again continued with the establishment of a set of plots on a virgin muck soil, part of a 200-acre area of deep muck still owned by the College from the original land grant made in 1855.

Within recent years, the potash situation in this country has undergone a very marked change. Instead of being dependent on Germany, as at the time of the first World War, the United States is now producing, within our own country, all the potash that we require. Although most of the refined American potash salts contain at least 60 per cent K_2O, equivalent to 95-98 per cent potassium chloride, the potash mines located at Carlsbad, New Mexico, are producing a mine-run potash salt of commercial importance called manure salts, containing around 40 per cent potassium chloride, equivalent to 22-26 per cent K_2O, with about 55 per cent sodium chloride as the principal impurity. It is only natural that we should include, in our new set of plots, treatments with this American mine-run salt rather than to use imported kainite. Owing to the present situation in America, it now appears possible that the farmers of our country may find it to their advantage to use some of the lower-grade potash salts. If this should prove to be the case, it is advisable that we know a little more about the possibilities of fertilizing with this low-grade potash, and with salt, and more about the crops which are salt-responsive and which are, therefore, likely to be especially benefited by such fertilization.

The purpose of this study, as finally outlined, was to determine several points; viz.,

1. What crops will ordinary salt benefit?
2. Can the potash application be reduced or omitted entirely when salt is used?
3. Is the benefit from salt due to the sodium or the chloride contained in it?
4. Is there an economical and effective source of salt in the form of an impurity in low-grade potash fertilizer?

For that reason, I am presenting in Tables 1 and 2 average yields of some of the salt-responsive crops, as secured from the various treatments in our experimental studies for a period of years. A review of these results shows that salt is highly effective in increasing the yields of several crops and that it can-



The sugar beet leaves shown in the picture were carefully selected to be of the same age. The upper ones received no salt while the lower ones received 1,000 lbs. per acre. Note the areas affected by leaf spot on those without salt, a disease that generally does not appear on the salt-treated beets until around 10 days later.

TABLE 1.—EFFECT OF VARYING SALT AND POTASH APPLICATIONS TO MUCK SOIL ON YIELD OF SEVERAL CROPS *

Order of Plots**	Fertilized*** annually 600 lbs. per acre 1932–37. 900 lbs. per acre 1938–41	Annual salt application 1932–41 lbs. per acre	Average yield in tons per acre				
			Roots			Celery	Swiss chard
			Table beets	Turnips	Mangels		
			6 years 1932, '34, '35, '37, '38 & '39	4 years 1935, '36, '38 & '39	2 years 1932, '40	8 years 1933–35 and 1937–41	2 years 1932, '36
1, 6, 11	0–8–24	0	10.4	9.8	12.1	19.2	17.7
2	0–8–12	500	18.2	11.6	18.0	22.3	23.5
3, 8, 10	0–8–24	500	19.3	13.6	23.8	25.3	26.5
7, 9	0–8–24 (Kainite)	0	17.4	13.0	23.9	25.2	22.4
5	0–8–24	1000	21.9	15.5	31.4	25.5	31.0
4	0–8–48	0	17.0	12.4	22.4	22.9	23.0
12	0–8–0	500	5.6	4.2	4.7	11.9	7.7

* An earlier and more detailed report of the results presented in Tables 1, 2, 3, and 4 was published as the "Effects of Applying Common Salt to a Muck Soil on the Yield, Composition, and Quality of Certain Vegetable Crops and on the Composition of the Soil Producing Them," in Jour. Am. Soc. Agron. Vol. 33, No. 11, Nov., 1941.

** Plots 7 to 12, inclusive, were not established until 1933. Averages of table beets, Swiss chard, and mangels include only plots 1 to 6 in 1932.

*** Potash in 0-8-24 applied on plots 7 and 9 was in the form of imported Kainite (20 per cent potash); potash used in mixtures for remaining plots was in form of the muriate, 50 per cent K_2O containing approximately 12 per cent sodium chloride in 1932 and 1933, and 60 per cent K_2O containing approximately 2 per cent sodium chloride from 1934 to 1941, inclusive.

TABLE 2.—EFFECT OF VARYING SALT AND POTASH APPLICATIONS TO MUCK SOIL ON YIELD, SUGAR CONTENT, AND PURITY OF SUGAR BEETS

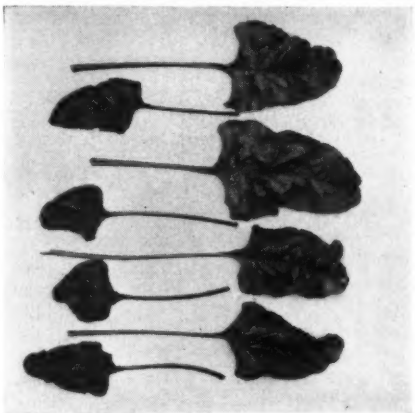
Order of Plots	Fertilized* annually 600 lbs. per acre 1932–37. 900 lbs. per acre 1938–41	Annual salt application 1932–41 lbs. per acre	Average for 8 years, 1932–41				
			Tons per acre		Sugar		Purity %
			Roots (crowned)	Tops and Crowns**	Sucrose %	Recoverable*** lbs. per acre	
1, 6, 11	0–8–24	0	8.2	9.4	15.0	2049	85.2
2	0–8–12	500	10.7	13.0	15.4	2779	84.5
3, 8, 10	0–8–24	500	12.1	13.6	15.7	3249	85.6
7, 9	0–8–24 (Kainite)	0	11.8	12.7	15.8	3197	85.8
5	0–8–24	1000	12.2	12.8	16.0	3312	84.9
4	0–8–48	0	11.4	10.7	15.8	3109	86.1
12	0–8–0	500	3.3	8.3	10.3	466	68.5

* Source of potash on all plots except 7 and 9, 50 per cent muriate 1932 and 1933; 60 per cent in later years.

** Tops and crowns not weighed in 1941. Average for 7 years only.

*** Recoverable sugar equals total sugar multiplied by per cent purity.

not be used as a substitute for potash but rather as a supplement to it. It is interesting to note that the salt, when used with potash, did not decrease the percentage of sugar in the sugar beets nor the percentage of purity, which is a measure of the proportion of sugar that can be recovered in the sugar factory. When the potash was omitted and salt used with phosphate alone, yield, sucrose, and purity percentages showed decided decreases. In addition to the crops listed in Tables 1 and 2, which were greatly benefited by the salt application, cabbage, celeriac, kale, kohlrabi, radishes, and rape have shown some benefit from salt, applied in addition to the regular fertilization. Crops



The table beet leaves at the left have turned purple prematurely. The effect of the salt application is to keep the leaves growing with a healthy green color up to the time of frost.

which have shown no response to salt in these trials include asparagus, broccoli, Brussels sprouts, carrots, cauliflower, corn, lettuce, onions, parsnips, peppermint, potatoes, rutabagas, spinach, and tomatoes. It must be noted that the potash used in the fertilization of these crops contained small quantities of salt as an impurity.

With the annual applications made each year but the crops rotated on the plots so that they were not grown on the same area for two years in succession, the 1,000-pound-per-acre application of ordinary salt gave better results in the early years than did the 500-pound application. In the later years, however, the build-up of salt in the soil was such that the 500-pound application generally gave as high yields and sometimes higher than did the 1,000-pound application. It should be realized, however, that in most rotations, the salt-responsive crops are not likely to be repeated year after year but are more likely to be alternated with non-salt-responsive crops. For that reason, it is quite possible that, on organic soils, the 1,000-pound application of salt may be well worth while for the four members of the beet family, and for turnips and celery.

Because of this very marked influence from the use of salt, when applied along with potash, on yield of several different crops, a study was made to determine the effect of the salt application on the chemical composition of the crop. The work was done in cooperation with Dr. E. J. Benne of the Chemistry Experiment Section in the Division of Agriculture at Michigan State College. Although a number of crops were analyzed, the analyses of only a few are presented in Table 3. The percentage of sodium oxide in the green crop showed a marked increase when salt was applied, except in the case of turnips where the increase was slight. The content of potash showed a slight decrease with use of salt, except in the case of turnips. The amount of sodium oxide removed in the crop was increased very markedly in all three crops when salt was applied. The amount of potash was slightly increased in celery, showed no variation in the case of table beets, and was markedly increased in the case of turnips. The analysis of the crops which received 20 per cent kainite showed a composition similar to those receiving the 60 per cent potash plus salt. Onions, unlike the other crops, showed a decrease in yield when salt was applied, while asparagus was not benefited. The percentage of sodium oxide absorbed by the onions was very low, although there was some increase when salt was applied. The amount of sodium oxide removed by the crop

showed a considerable increase but the maximum absorbed was only a fraction of that absorbed by the other three crops. Both the percentage potash in the onions and the amount removed by the crop showed a decrease when salt was applied.

The question next arose as to whether the benefits of the salt were due to the sodium or the chloride. In order to get some idea of this, both sodium and chloride were determined in the 1937 crops of sugar beets and celery. A disturbing factor in this study lay in the fact that the potash applied was likewise combined with chloride. Table 4 shows the percentages of these constituents and the ratio between sodium oxide and chloride of the different treatments. It is interesting to note that, although both sodium and chloride were absorbed in greater amount where salt or kainite was applied, the absorption of sodium was very much greater than that of chloride, as indicated by the difference in ratios. It should also be noted that by far the greater proportion of the chloride absorbed by the sugar beet crop, when salt was applied, was

(*Turn to page* 48)

TABLE 3.—EFFECTS OF VARYING SALT AND POTASH APPLICATIONS TO MUCK SOILS ON THE CONTENT AND REMOVAL OF SODIUM OXIDE AND POTASH BY CELERY, TABLE BEETS, AND TURNIPS

Order of plots	Fertilized annually 600 lbs. per acre 1932–37 900 lbs. per acre 1938	Annual salt application 1932–38 lbs. per acre	Crop yield tons per acre	Percentage in green crops		Pounds per acre removed in crop	
				Soda (Na_2O)	Potash (K_2O)	Soda (Na_2O)	Potash (K_2O)
Celery—Average 1937 and 1938 crops							
1, 6, 11	0–8–24	0	23.0	0.08	0.27	35	126
3, 8, 10	0–8–24	500	30.9	0.31	0.23	189	142
5	0–8–24	1000	34.4	0.28	0.22	191	149
7, 9	0–8–24 (Kainite)	0	31.8	0.26	0.23	168	145
Table beets—Total crop—1938 crop							
1, 6, 11	0–8–24	0	20.3	0.13	0.43	53	175
3, 8, 10	0–8–24	500	29.2	0.30	0.26	177	152
5	0–8–24	1000	28.4	0.36	0.31	206	178
7, 9	0–8–24 (Kainite)	0	27.3	0.30	0.32	162	176
Turnips—Roots only—1938 crop							
1, 6, 11	0–8–24	0	8.1	0.07	0.18	11	29
3, 8, 10	0–8–24	500	11.6	0.11	0.17	26	40
5	0–8–24	1000	13.0	0.09	0.22	24	58
7, 9	0–8–24 (Kainite)	0	11.7	0.13	0.18	30	43
Onions—Bulbs only—1939 crop							
			Bu.				
1, 6	0–8–24	0	1017	0.004	0.13	2.3	71
3	0–8–24	500	895	0.010	0.12	5.0	59
5	0–8–24	1000	914	0.015	0.11	7.7	56

This Maryland farmer supplements grazing with generous rations of feed to keep his dairy cows at peak milk production throughout the season.

How Best Use Our Feed Crops?

By C. B. Sherman

U. S. Department of Agriculture, Washington, D. C.

IN this war and immediately afterward, the best use of crops to get the best human results from them is of utmost concern. Essential facts concerning nutritive values of foods and human dietary requirements have been provided by comparatively recent intensive research. This knowledge has come in time to supply a nutritional basis for planning the most efficient possible use of our resources at a time when, vast as they are, these resources do not readily equal the world-wide demands that will be made upon them.

This efficiency in use is measured by the output of food nutrients obtained per unit of resources used. Raymond P. Christensen, with others in the U. S. Department of Agriculture, has been exploring the possibilities and has brought forth some interesting results that are capable of very practical application.

Resources considered by them are given quantities of feed, land, and labor. Definitions, methods, measurements, and analyses used in these explorations have been meticulously set forth in report form, but space requires that the facts here be limited to those that answer the practical question which involves the readers of this magazine; namely, how can we best use our feed crops after we raise them?

The various classes of livestock compete directly in many areas for feed, land, and labor as well as for other resources, Mr. Christensen reminds us.

Within a short period, say one year, substantial shifts in the allocation of resources among classes of livestock may take place. In the period ahead, we shall probably have to so use our resources for livestock production as to contribute most to the total food supply.

Feed units are used when comparing the feeds consumed by each class of livestock, and the efficiency in turning them into food nutrients. Other relationships, the use to which the farm product is usually put, and other pertinent considerations are weighed and plotted. The practical deductions in regard to feeds, when reduced to laymen's terms, are as follows:

Hogs are most efficient in converting feed grains into food energy and fat on an average basis. But in areas where large quantities of roughage feed are available, grain used in combination with otherwise unused roughage to produce milk will yield more food energy and fat than the grain would yield if used in alternative ways. The really significant comparison to make between livestock is their efficiency as sources of protein, minerals, and vitamins. Certain minimum quantities of animal proteins are required in human diet. Protein is a rough measure of the lean meat obtained from livestock, and the production of meat animals at the present levels is desirable chiefly because meat is a so-called morale food which consumers seem to crave.

Further Comparisons

Whole milk and eggs rank ahead of meat animals as sources of protein, minerals, vitamin A, and riboflavin, whereas meat animals are more efficient as sources of thiamine and niacin.

Although feed can be shifted among the classes of livestock rather quickly over a short time—a year for instance—such shifts are limited by the possibilities of changing livestock numbers and changing the feed consumption per animal. Hogs and poultry provide the greatest opportunities for changing numbers in a relatively short time, while the number of milk cows may be increased by reducing the rate of culling.

Assuming that additional feed will be available for increased livestock, what will be the average efficiency of each class of livestock in converting this additional feed into nutrients? The efficiency of livestock in using this additional feed will be affected by changes in the number of animals as well as by changes in production per animal. Without going into all the side considerations, what can be said about changes in production from the viewpoint of distributing the available feed supplies among livestock in a way to maximize output of the food nutrients which are expected to be in short supply?

The Increased Goal

Compared with other farm products, the goal for milk should be much higher next year—that seems obvious to Mr. Christensen and his associates. The most efficient way of supplying the food nutrients that are needed most is to use more of our milk as whole milk, and to try to produce more milk as well.

Production of milk could be increased considerably in the next year or two, he points out, if feed is made available and the necessary economic incentives are provided. According to the best information, a 5 per cent increase in milk per cow could be obtained by heavier feeding, without decline in average efficiency.

As the feed supplies are limited in spite of our huge crops last year, it will probably not be possible to have great expansion in milk production and yet maintain the present output of other livestock products. So, another year, it may be necessary to reduce the output of these other products.

If we are to increase food output in terms of food nutrients, that may be the thing to do. What then are the conclusions from this point of view?

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Sericea lespedeza is being mowed for hay when plants are approximately 12 inches high. At this stage sericea makes good hay.

Sericea Is A Good Crop

By R. Y. Bailey

Chief, Regional Agronomy Division, Soil Conservation Service, Spartanburg, S. C.

AFTER a slow start, sericea lespedeza is steadily coming into its own as an important crop in the South. From 1896, when the first planting was made at the North Carolina Agricultural Experiment Station, until 1934 it was estimated that less than 2,500 acres had been planted to sericea in the seven Southeastern states of Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi. Since that time, the acreage in these states has been increased to more than 100,000 acres.

Slow progress during the earlier years was due largely to a lack of information about cultural methods, utilization for hay and grazing, and to the limited supply of seed. In many instances, unscarified seed was planted at such a low rate per acre and covered so deeply that very thin stands were obtained. Following the practice of mowing for hay when the plants were in bloom, used with most other legumes, the quality of hay was so poor that sericea was thought by many to be of no value.

The Bureau of Plant Industry conducted trials with sericea at the Arlington Experiment Farm, Va., and distributed small quantities of seed to state agricultural experiment stations and to individual farmers. Several of the state stations made studies of cultural methods and of utilization of

sericea for hay and grazing. As a result of these studies, it was learned that better stands could be obtained from scarified than from unscarified seed, and that the seed required little or no covering. It was also learned that sericea made hay of good quality if cut while plants were still young and succulent. At the Tennessee Agricultural Experiment Station, sericea was grazed by livestock while the plants were young and succulent.

At several of the Soil Conservation Service demonstration projects and CCC camps, sericea was planted rather extensively for erosion control on steep slopes and in waterways into which water from terraces was discharged. In the spring of 1937, information from the Bureau of Plant Industry and the experiment stations was used as a basis for a simple set of planting instructions that were used in all areas where the Soil Conservation Service was operating. As further experience was gained with sericea, these instructions were revised and used in soil conservation districts. This method of planting consisted of sowing 30 pounds of scarified seed per acre following a cultipacker or a drag harrow on well-prepared soil without covering. Cultipacking and harrowing were done approximately on the contour to avoid drifting of seed in case heavy rainfall occurred soon after seeding. On very steep slopes, cultipacking after sowing presses seed into the soil and reduces drifting.

Although the rate of seeding was somewhat heavier than might have been required under ideal conditions, stands were not too thick on the unfavorable sites where sericea was usually planted. Many of the farmers did not have the equipment needed to prepare good seedbeds, and there was often a loss of seed as a result of drifting and silting on the steeper sites. Uniformly satisfactory stands were usually obtained where this method was followed. Where sericea was planted on bare areas of raw subsoil, stands were greatly improved by light mulching with straw, damaged hay, or coarse manure.

Most of the seeding was done in April, May, and June, although sericea may be planted over a considerably longer period. Satisfactory stands have been obtained by planting scarified seed from early corn planting time, or a little before, through July. Good

Hauling in a good crop of sericea hay the middle of May on a York County, South Carolina, farm.

Corn following a five-year-old stand of sericea in Clay County, Alabama, made 53 bushels per acre in 1941. This was more than three times as much as the yield on similar land nearby where no sericea had grown.

stands have been obtained by seeding sericea immediately after the last cultivation of corn in July. In a few instances, drought immediately after seeding killed young seedlings before they established a good root system.

Larger yields of hay have been obtained the second year from early spring than from June and July seedings. Particularly on sandy soils in the Coastal Plains, better stands have been obtained from early than from late spring seedings.

Best stands of sericea have usually been obtained where it was sown on clean land without a nurse crop. Sometimes farmers got satisfactory stands by seeding on small grain early in the spring, but many failures also resulted from this method of planting. Particularly in the middle and lower South, dry weather in May has resulted in poor stands where sericea was seeded on grain. The maturing grain crop had drawn so heavily on soil moisture that a large percentage of the young sericea seedlings died before they could establish a good root system.

Satisfactory stands of sericea have been secured by disking small grain stubble after harvesting, cultipacking, and then sowing sericea seed. Better stands resulted where the grain was mowed for hay so as to allow the sericea to be seeded a few weeks earlier than where the grain was allowed to remain until ripe. This method of seeding allows sericea to be planted without losing the use of the land for a year. The yield of hay the second year is not usually as large as it is from plantings made early in the spring.

Unhulled sericea seed has given good stands when sown the latter half of the winter. Unhulled seed is less dependable than clean, scarified seed. In order to insure stands that are thick enough to control erosion on sloping land, it is usually advisable to sow approximately twice as much unhulled as scarified seed.

Sericea makes little growth the first year. The young seedlings are usually practically hidden by weeds so that the crop appears to have failed. Farmers have been known to plow up good stands of sericea the first year because they thought the crop had failed. Plants make very rapid growth in the spring of the second season and are usually

ready to cut for hay by the first to the middle of May. Mowing for weed control during the first growing season is not necessary, unless a dense stand of crab grass is present. If mowing is done, it is important that the cutter bar be run high enough to avoid cutting the sericea plants near the ground. A few instances have been seen where stands were practically destroyed by close mowing the first growing season.

Sericea requires well-drained soil. It will not grow on marshy land nor on soils where the water table is very near the surface. It has grown on some of the heavy plastic clay soils that are not adapted to kudzu. Because of its ability to grow on soils with plastic subsoils, sericea is the best adapted perennial forage crop for soils like Iredell in the Piedmont and the acid clay soils of the Black Belt of Alabama and Mississippi. Sericea also grows well on some of the brown loams such as Grenada in north Mississippi and west Tennessee that are usually referred to locally as being too cold for kudzu.

Most of the seed used in demonstration-project and CCC camp areas was furnished by the Soil Conservation Service as a means of determining the possibilities of sericea as a soil-conserving crop on steep slopes and in waterways. It was also desired to get enough acreage established from which to harvest seed required in expanding the acreage as rapidly as possible, provided sericea proved to be a satisfactory soil-conserving crop.

A total of 2,742,000 pounds of sericea seed was reported by the Division of Crop Estimates of the Bureau of Agricultural Economics to have been harvested in the states of Virginia, North Carolina, South Carolina, Tennessee, Georgia, Alabama, and Mississippi in 1942. Of this amount 1,940,000 pounds were harvested in Alabama, Georgia, and South Carolina. Assuming that the seed harvested would yield 50 per cent clean scarified seed, the seed harvested in 1942 would, at 30 pounds of scarified seed per acre, plant approximately 45,700 acres.

The deep roots of sericea enable it to withstand periods of drought when most other crops suffer severe damage.

Increase in the acreage of sericea also has been stimulated in several of these states by AAA payments. These payments have helped to pay the cost of establishing sericea. Important as financial assistance was, however, technical assistance now being given through soil conservation districts is by far the most important factor in getting the acreage of sericea increased. Farmers who are assisted in planning where, when, and how to plant sericea are taking advantage of the opportunity to earn payments in this way to a much greater extent than are those who do not receive this technical assistance. Also, farmers who receive such assistance are utilizing sericea for hay to a

greater extent than farmers outside conservation districts.

Sericea has proved its value as a soil-conserving crop on steep, eroded land where it has grown satisfactorily with less lime and fertilizer than are required by most other forage crops. It is giving excellent protection against erosion on slopes and in waterways, provided thick stands are obtained. Thin stands have proved to be too open for adequate protection on steep slopes. Thick, uniform stands are absolutely essential for protection against erosion on steep slopes or in waterways, and are highly desirable on all sites. It was largely for this reason that a fairly heavy rate of seeding was used.

Farmers who mow sericea when the plants are about 12 inches high, rake soon after mowing, and store the hay in the barn the following day are usually well pleased with the quality of the hay. Cases of dissatisfaction with the quality and palatability of sericea hay that have been investigated usually have been due to late mowing that resulted in coarse, stemmy hay, which retained only a small percentage of its leaves.

In a few feeding trials where alfalfa and sericea hay were compared in the ration of dairy cows, sericea was about 80 per cent as efficient in milk production as alfalfa. Any forage crop that will produce hay which is 80 per cent as good as alfalfa, on land that is too poor for alfalfa or most other forage crops, has a place in the Southeast. There is a vast acreage of eroded land in this section that is now producing little or nothing of value. Sericea, if planted on this poor land, would make a valuable contribution toward a livestock program in the cotton-producing states where so much has been said about the need for developing livestock as a supplement to cash-crop farming.

Much of the sericea that is being grown for hay is on land that is not suited to the production of most other crops. T. L. Morrison, Route 1, Newell, Ala., was assisted by the Piedmont Soil Conservation District in planning his 104-acre farm. He had 17 acres that were too steep and too severely eroded for row crops. The conservation plan provided for 5 acres of this steep land to be planted to sericea and the remaining 12 acres to kudzu.

Mr. Morrison harvests approximately 7 tons of hay annually from his 5 acres of sericea. Like many other farmers, Mr. Morrison is able to get most of his hay from perennials that are growing on land unsuited for row crops. This enables him to turn a large part of the annual legumes in his rotations back to the soil to increase its productivity.

Yields of sericea hay have usually been from 1 to 2 tons per acre annually. Most of the land that was planted to sericea usually produced less than 15 bushels of corn per acre. On good land, yields of 3 tons of hay per acre are not unusual.

Sericea As A Seed Producer

Sericea is a fairly good seed producer. Yields of unhulled seed have varied from 200 pounds to 1,000 pounds per acre. Seed production often is reduced by very dry weather during the late summer and fall. If harvested soon after frost, from 400 to 600 pounds of unhulled seed per acre may be expected. Seed shatter and may be lost if not harvested within a few days after the first killing frost in the fall.

Field-run seed usually yields as much as 50 per cent clean, scarified seed. The percentage of clean seed, of course, depends largely upon the amount of trash and leaves left in it by the combine.

The most satisfactory harvesting of seed has been where one cutting of hay was taken early in the spring and the second growth was left for seed. The height of the plants is more uniform and the stems are finer where one cutting of hay is taken than where the entire season's growth is left for seed production. In the latter case the stems tend to be too coarse to be handled satisfactorily by the small combines commonly used in the South.

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Putting Fertilizer Down Puts Crops Up

By A. W. Klemme

Extension Specialist in Soils, Dept. of Soils, University of Missouri

ACCORDING to many field trials in Missouri, the application of commercial fertilizers can be expected to give profitable returns. These come as larger yields and better quality of small grains and grasses, both of which make most of their growth in the fall and early spring in the longer growing season as we have it in this State. This is also in accord with the more favorable distribution of rainfall. On late spring and summer-growing crops, like corn and soybeans, the response to fertilizers in this State has been erratic. These crops may meet less favorable distribution of rainfall.

Row applications of 150 pounds per acre on corn with a modern fertilizer attachment on the planter will increase corn yields from 5 to 12 bushels per acre in years when the rainfall is well distributed throughout the growing season. On the other hand, yields may be decreased in seasons with short droughts, especially if these occur during the tasseling and silking stage.

The erratic response from year to year is illustrated in the yield records

Corn where 800 lbs. of 10-10-10 were plowed under shows little "firing" even though the growth was much greater.

Corn where 133 lbs. of 3-12-12 were applied in row with modern fertilizer attachment. Note the excessive "firing."

of fertilizer test plots on corn. In 1937, the plots on Oswego silt loam, a gray prairie soil of southwest Missouri, were given an application of 150 pounds of a 4-12-4 fertilizer in continuous bands on each side of the row. They yielded 5.1 bushels more corn per acre than the plots receiving no fertilizer. In 1938 the same fertilizer gave no increase in yield. On Marshall silt loam in 1937, the application of 150 pounds of 0-12-4 per acre increased the yields by 9 bushels per acre, while in 1938 the plots with a like application yielded less corn per acre than the plots receiving no fertilizer. These erratic responses to fertilizers by the corn crop usually have been charged to weather conditions.

It has been generally believed that if droughty periods and hot winds occur when the corn is tasseling and silking, the viability of the pollen is damaged and corn yields are reduced. In general, it has been believed that fertilizer applications may hasten growth so as to bring corn into the tasseling stage when such droughts occur; and, if so, that yields are not increased or may even be reduced by fertilizers. Contrariwise, there is ample evidence to show that fertilizers may hasten development so as to escape this critical period, and yields may be increased.

Recently some more helpful concepts of this erratic response of summer-grown crops to fertilizers applied in the row have been suggested. Fertilizers remaining in the soil as salts, it is believed, may be the cause of such crop injury. There is further suggestion that when adsorbed on the soil they are helpful. It has been pointed out by Albrecht [1] that fertilizer nutrients or salts must first react chemically with the colloidal material of the soil if they are to become most serviceable to plants. When the fertilizer is applied in concentrated areas as in row applications, only a portion of the ions of the fertilizer salts react rapidly and become more completely absorbed by the soil. The

[1] Albrecht, William A. *Adsorbed Ions on the Colloidal Complex and Plant Nutrition.* Proceeding Soil Science Soc. of America 1940, Vol. 5, pages 8-16.

balance remains as a salt to give a strong solution injurious to the tender plant root. When fertilizer is drilled with fall-sown small grain the cooler, more moist, and longer growing season allows chemical reaction to become more complete before the slowly advancing roots meet the unadsorbed salts. This serves to reduce the salt effect and to make the nutrient ions more effectively available so that the crop response is more certain.

In midsummer when short droughts occur, the feeding roots of the plant move downward to moisture. In most Missouri soils there are less available nutrients in the subsurface and subsoil zones than in the surface soil. It is during these periods when the need of the plant for soil nutrients is often greatest. The so-called "firing" of corn which occurs during these periods may in many cases really be starvation for the essential plant nutrients. Scarseth[2] of the Indiana Agricultural Experiment Station has shown that in Indiana, where weather conditions are not so variable, the "firing" of corn can be reduced and yields can be increased by broadcasting and plowing under a part of the fertilizer, or by placing it lower down or on the plow sole with a special fertilizer attachment on a plow.

An exploratory study of fertilizer placement on corn was started in Missouri in 1941, in cooperation with the Midwest Fertilizer Committee and the American Potash Institute. It was designed to test this belief that "firing" of corn was a matter of plant-food deficiency and, further, that the fertilizers placed so as to allow them to be absorbed by the soil would be more effective than if too near the seed and early roots. Eight cooperative test plots on different farms were established with one each on the silt loams of the soil series of Marshall and of Knox, the two more fertile loess soils of northwest Missouri; of Summit, a residual prairie

Corn, where no fertilizer was applied, "fired" badly.

[2] G. D. Scarseth, Agronomy Mimeo. No. 36. Purdue University, Agri. Ext. Station, Department of Agronomy.

limestone and shale soil of central Missouri; and of Wabash, along the Mississippi River in northeast Missouri; and with four on Putnam silt loam, a typical claypan prairie soil of northeast Missouri. The fields taken over in all of the selected areas except three were in second-year sweet clover just before going to corn. One of the exceptions was a field in red clover sod, another was in small grain and lespedeza, and the third had been in corn the previous year.

In order to put the fertilizer down, it was broadcast with a fertilizer grain drill and plowed under with a tractor plow. On those soils that are relatively high in organic matter such as the Marshall, Knox, Wabash, and Summit silt loams, the broadcast applications were 400 pounds per acre each of 0-20-0 and 0-20-20. Two additional plots were added on three of the test areas on the gray prairie soils. On one, there was applied an equivalent of 800 pounds per acre of 10-10-10 fertilizer; on another 400 pounds of sulphate of ammonia were plowed under. Across these broadcast applications that went down into the soil, some fertilizer was applied in the row as a contrasted surface application with a modern corn-planter attachment. The fertilizer grades and rates per acre in the row applications were approximately 0-20-0 at 80 pounds, 4-16-4 at 100 pounds, and 3-12-12 at 133 pounds.

Because of the excessive rainfall during the late spring, of severe insect damage by the Grape calapsis, and of the severe drought late in the season, complete data as to yield from all these plots were not obtained, but some interesting observations were made. The insect damage was less severe and the growth was larger and more vigorous on plots that had plowed-under, broadcast, or row applications of the 10-10-10, 0-20-20, and/or the sulphate of ammonia than where no fertilizer was used or where it was put on in the row applications. The latter type of application, however, caused the corn to grow more rapidly at first. Harvest records where taken showed little differences in yields for any of the plots.

The plots receiving the 10-10-10 fertilizer plowed under withstood the drought for 10 days to 2 weeks longer without serious "firing" than did the plots receiving fertilizer in the row, or those which received no fertilizer. The quality of corn produced from all plots, except those receiving sulphate of ammonia alone, was superior to that of corn grown on those receiving no fertilizer.

That there were residual effects from fertilizers used in 1941 passed on to the succeeding crops in 1942 was shown by their increased growth and vigor. Yield data were obtained from corn following corn on one area of Putnam silt loam on the Raymond Brown farm in Audrain County. The sweet clover and the fertilizers were plowed under and planted to corn in 1941. This area was planted to corn again in 1942 in order to test the carryover of fertilizer after one crop of corn had taken its toll. The results as corn yields in the second crop are given in Table 1.

TABLE 1.—EFFECTS OF FERTILIZERS BROADCAST AND PLOWED UNDER FOR CORN IN 1941 AS THEY CARRIED OVER TO MODIFY THE YIELDS OF THE CORN CROP IN 1942.

Grade and Rate/Acre	Bu./Acre
None	41.5
400# sulphate of ammonia	60.0
800# 10–10–10	61.0
400# 0–20–20	54.5
400# 0–20–0	53.5

These yields of corn and the difference in crop growth with serious or less serious "firing" during the summer all point to the fact that the corn crop was pushed up as the fertilizer was put down into the soil by plowing it under, rather than by leaving it in the surface as the row placement locates it. Such results from the immediate crop and the effects as carryover to the succeeding crop all support the belief that "firing"

Left, no fertilizer. Right, 800 lbs. 10-10-10 broadcast and plowed under. Even though there was a severe drought, the fertilizer greatly improved the quality of corn.

by row placement may be a kind of salt effect, or bad placement, in the dry-soil layer that lets the crop start off well but starves it later when the active roots are down in the deeper but nutrient-deficient areas of the soil. Plowing the fertilizer under puts it into the region where it is changed from the salt to the adsorbed condition. It appears to be good soil chemistry and good plant physiology as well as good farm economy.

In further test of the idea of absorbing the fertilizers on the soil before the plant roots get to them, two additional trials on fertilizer placement were started in the spring of 1942. One was with soybeans on Gerald silt loam, a claypan soil of southwest Missouri, the other was with corn on Oswego silt loam in the same part of the State. The field layout was much the same as used formerly except that all the treatments were applied in the same direction.

The fertilizers used on both plow-down and row-application plots of the soybeans were 0-20-0, 0-20-10, 0-20-20, and 4-16-4. The rates of application for the plow-down tests were 200 and 400 pounds per acre except for the 4-10-4 which were 250 and 500 pounds per acre. The same fertilizers were used on the corn plots except that equivalent applications of 2-12-6 were substituted for the 4-16-4. A portion of the soybean field had been limed in 1939. The entire field had grown wheat-lespedeza in 1940 and 1941. The corn field had been limed in 1939 and had grown sweet clover which was plowed down ahead of the corn.

Row applications of 200 pounds of 0-20-0, 0-20-10, and 0-20-20 and 250 pounds per acre of 4-16-4, or 333 pounds of 2-12-6, were made with a modern fertilizer-planter attachment in case of the soybean land on both the limed and unlimed areas and on the corn. The fertilizers for deeper applications were broadcast with a fertilizer grain drill and plowed under immediately with a tractor plow.

Scioto soybeans planted on May 27 and 28 gave an excellent stand on this Gerald silt loam. The crop was harvested with a combine on October 16. Where the fertilizers were plowed under yield results were those in Table 2.

Even without the use of fertilizers,

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Why Do Farmers Plow?[1]

By Wm. A. Albrecht

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THAT is "an easy question to answer" for the farmers who know how to plow and who "like to plow." They are legion who "get pleasure out of seeing the soil turn turtle," and who will tell you that they plow to improve their crops in quantity and in quality. To fly into the face of the testimony which is the observation of the myriads of tillers of the soil during the ages past, and to deny that there is any scientific basis for this practice, even if it is not known by the farmers, will demand strong and sound evidence.

Without doubt, we have been doing too much plowing, but there is a background of birthright and history for it. North European origin and ancestry, so common in the United States, bring plowing into the foreground as a tillage habit to aerate and warm the heavily textured soils of that climatic region. Farming demanded plowing, and one doesn't make a living without plowing on a farm that is of clay loam or clay texture, and under liberal and regular rainfall. Areas of older agriculture have survived because of heavy soils. Agriculture on sandy soils has been fleeting. Farmers from these older agricultural sections couldn't conceive of farming without plowing. To them, as to the majority of us, the plow has always been the symbol of agriculture.

Plowing without understanding its functions in relation to the soil and the soil fertility, however, now demonstrates that we have done too much plowing—and much unnecessary plowing. There is the inclination in this confession to condemn the very practice itself. Because too much alcohol, strychnine, or opium taken indiscriminately is deadly, shall these stimulants and pain relievers be denied to the physician? We have been too prone to treat all soils, regardless of texture and structure, to the same frequency of plowing. We are just now examining this, at least from the viewpoint of economy.

Results of Excessive Plowing

During the importation of the plowing idea and the application of the practice in the United States, our ancestry did not recognize their transition to soils that are mainly silt loams, that demand less plowing than European clay loams. They failed to appreciate the connection plowing might have with their movement from regions where the rainfall comes regularly in small showers to those where a large share of the rains are torrential. This failure was more serious in our westward trek to central United States, where the relative torrential nature increases as total rainfall diminishes. This shift from maritime to continental climate was not appreciated until much plowing under torrential downpours put erosion of almost catastrophic magnitude over our most productive areas.

Our ancestors—and we, like them—failed to recognize also that in moving some 700 or more miles southward, one is going toward increasing continentality with its higher and more fluctuating temperatures. Here is the biological aspect of the rapid rate with which the reserve organic matter in the soil has been burned out. This was the basis of the high crop yields enjoyed by the

[1] The first of two articles on the controversial subject, "Do Farmers Plow Too Much?" The second discussion will follow in an early issue of this magazine.

pioneer for his much plowing. These yields were purchased at tremendous soil fertility costs, and this almost explosive exhaustion of the soil organic matter in our brief history has left the soil less receptive to the heavier rainfall, has encouraged greater run-off, and has brought with it the damaging erosion. Excessive tillage by plow and otherwise has not yet brought us to appreciate that it has also exhausted from the cultivated soils the very plant nutrients that now prohibit nature from quickly growing the vegetation that would cover her nakedness and reduce the erosion hazard.

Yes, we have plowed too much, as our hindsight forcefully tells us. But surely our foresight is better than to allow refusal to plow in the future.

Plowing Puts "Life" Into Soil Factory

Plowing does aerate the soil, as any soil microbiologist will testify. As a consequence of the change of atmosphere in the soil and because of the stirring by the mold-board plow, there is new "life." The soil is a factory in which much energy is expended. It is transforming many substances, oxidizing or burning tons of carbon to carbon dioxide, sulfur to sulfur dioxide, ammonia to nitrate, and other similar combustions. These important facts are disregarded as part of the soil's contribution to production of crops by him who would not plow.

When a 40-acre corn field under maximum growing activity in July is burning to form carbon dioxide the carbon equivalent of that used in running a steam engine of 40 horsepower, can any one deny the necessity of air for such a performance? Surely no one will close the draft and destroy such producing power by refusing to plow.

Air in the soil is not wholly a matter of the shifting water table, as soil science of the vintage of 1910 suggests. Water tables are located at extreme depths. This has been revealed by the numerous studies encouraging soil conservation because it is a practice in water conservation. These depth figures are so large as to be ample evidence that fluctuations of the water tables, even over wide range so far down in the soil profile, could mean nothing in the way of atmospheric air exchange with that in the surface soil.

Then, too, water can move up and down in the soil without moving as a whole water table. It can move without necessarily exchanging air within the soil for that in the atmosphere above it, much as water in the lower half of a bottle can exchange place with the air above it as the bottle is inverted, but yet remains tightly stoppered. Just as atmospheric air plays no role in this exchange of places by water and air in the bottle, just so can water move in the soil and air can move in the opposite direction, without atmospheric air entering.

Then, too, oxidations can occur in the soil in the absence of atmosphere. Chemical compounds of oxygen in the soil give up this element to supply it for various functions. It serves to burn substances in the soil just as saltpeter mixed with charcoal burns the mixture with a speed explosive enough to be gunpowder. Atmospheric burning of charcoal is too slow to make it serve as explosive.

The burning business in the soil by means of oxygen from the air or from chemical combustions serving in microbial respiration must go on if the plant nutrients tied up in combination with carbon are to be released for repeated use by other plants of succeeding generations. Were this performance not proceeding in the soil, life on the globe would soon become extinct. The soil's producing power would soon be expended. All of its chemical nutrients for sustenance of life, or its soil fertility, would be in combination in its own products of growth above the soil. As a result, the soil could offer nothing and no growth could occur. These fires of oxidation, because of microbial

life and activities within the soil, undo these growth products and let the elements make the cycle of growth, death, and decay again. The plow is a means of giving extra draft to hasten this cycle. Shall we prohibit this cycle by refusing to plow?

That plowing improves the efficiency of the soil, not only for oxidation of carbon but also as a nitrogen oxidizing factory to deliver this latter element in the form of available nitrates, is known to those familiar with the more recent developments in soil science. The soil's supply of soluble nitrogen increases during the early growing season as the temperature rises. It may rise to a very high point in fallow soil, or may be consumed by vegetation. It may be leached out by rainfall. It is low again by fall. It declines with the falling temperature or may be held down by excessive drying.

Some studies of the nitrate supply in the soil under corn during the growing season in three adjoining plots, one unplowed, one plowed, and one plowed and cultivated, tell forcefully that plowing provides a larger supply of soluble nitrogen as nitrates, Fig. 1. These were the results also in the absence of the crop and of weeds. Cultivating the soil three times, as corn is commonly handled, provides extra nitrate nitrogen via the soil as the producer of this plant nutrient. Crop yields follow in order of the level of these nitrate supplies. The crop depends on the rate of delivery of the soil fertility.

The farmer may not know that these higher levels of nitrate are the more direct causes of his improved crop yield associated with his making the "soil turn turtle." He plows ahead of the corn planting in order to get a better corn crop. His inability to point out the underlying scientific channels through which the effects of plowing are transmitted to the crop does not put the plow into bad repute in his sight. Surely, the hundreds of corn producers will not suddenly discard so ancient an implement merely because they cannot call to their help this scientific evidence when someone concludes for them that the plow is the cause of increased erosion and other devastation that is so easily associated with it.

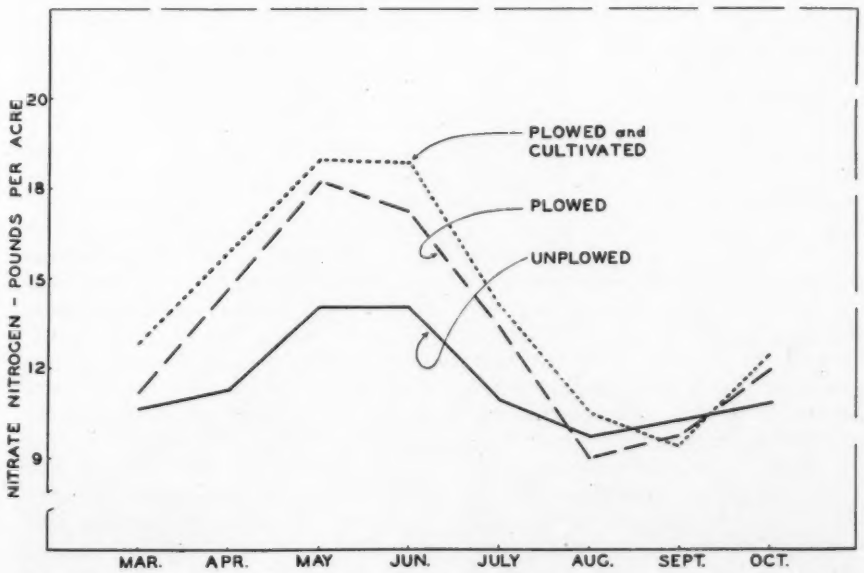


Fig. 1. Nitrate nitrogen under corn during the growing season as influenced by plowing and cultivation.

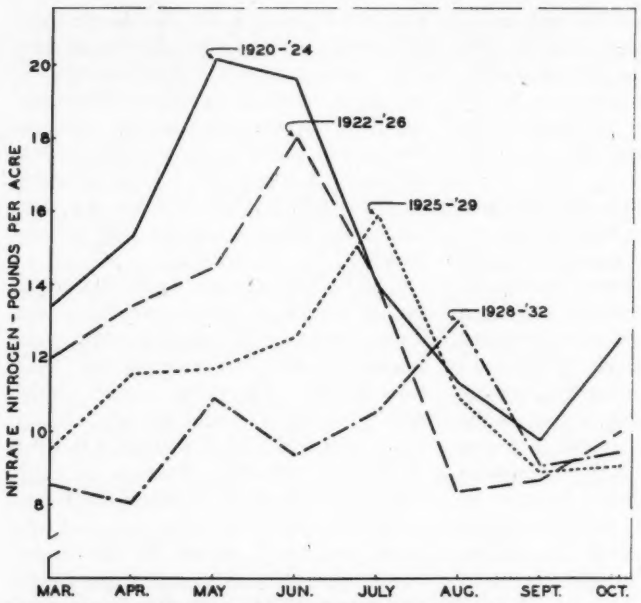


Fig. 2. Nitrate nitrogen levels in soil during succeeding five-year averages for the growing season to show declining supplies with maxima coming successively later in the season.

Plowing and cropping a soil year after year bring with them declining crop yields. For these one might readily pounce upon the plow as the culprit in the case. But one must not forget that cropping includes one crop above the soil as complex vegetation and another one within the soil as simpler biochemical products in microbial operations, Fig. 2. Soil plowed out of sod and put to crops such as corn or wheat, continuously, soon runs to bare land. Shall we blame the plow as it turns under trash and crop residues to make the field look clean? To the uninformed, this would seem to be evidence that "backfires into the argument that plowing produces a better environment for plant roots". The declining crop yields, which we have been trying so desperately to bolster up by imported crop substitutes or by new creations of the plant breeder, have other causes than merely the plowing operation. They cannot be explained away by the simple beliefs that "the explosive separation of the soil mass wrecks all capillary connections temporarily"; and that "the organic matter sandwiched in further extends the period of sterility of the soil due to dryness." Such deductions are much outmoded when they still pin all explanation on the movements of soil water.

Sterility of the soil is not always a matter of desiccation. Much as liquor has come and gone in our many discussions and legislations to eventually find its limited place in human life and let us move on toward a better understanding of nutrition as basic to our national well-being, so the water factor in plant existence has now been accepted as one under nature's control in quantity. Our attention has gone to plant nutrition as the managerial factor, where with little fertility addition we can do much for the plant, even to its water needs. As Mark Twain would have it, water in the soil goes back to the weather about which there is much talk but about which little is done. The factor of soil fertility, or of the nutrition of the plant, is one about which we can do something to give us more and better crops for the weather we have. Crops are as they eat, not as they drink. Fighting the weather is less helpful than fixing the fertility of the soil. Crops are not declining or failing because plowing is drying out the soil.

The forces that push plowed land into bare are not the moldboard plow and the horses or tractor with it; they are the continued removal of soil fertility with little return. They are the

(*Turn to page* 46)

PICTORIAL

A SCENE FROM THE BACKLOG OF AMERICA'S VICTORY ASSETS.

Above: Good pastures for hogs are highly recommended, especially in facing feed shortages.

Below: Four tractors, no horses, mowed, raked, baled, and hauled the hay on this Iowa farm.

Above: America's "breadbasket," at this stage, brings forth the poet's "Seas of waving gold." Below: Soybeans are beginning to achieve in this country some of the centuries-old credit due them.

Above: Well-fed and ready for their contribution to a continuous supply of healthful food.

Below: Many ration points will be spent when these "Steaks in the Making" appear on the market.

The Editors Talk

Food Programs

Before the war, the large and at that time burdensome surpluses of foods and feeds called forth many plans and programs to cope with the situation, partly by attempting to increase usage but mostly by reducing production. With the outbreak of war, it was realized that agricultural production, especially in certain lines, would have to be increased; but of all the problems confronting the country following Pearl Harbor, it was felt that agricultural supplies fortunately would not be troublesome nor need much attention. The extraordinarily good yields obtained in 1942 due to a fine response by farmers to appeals for increased production combined with highly favorable weather further lulled much of the country into a complacent attitude regarding food supply and production.

Huge demands made by a hard-working public, the military services, and our allies have caused these large supplies and surpluses of agricultural products to disappear with alarming rapidity during the past year. The amazing domestic consumption has showed the country that the potentialities of increased consumption were barely scratched by the programs in effect during the period of surpluses. Those who urged more attention to this method of coping with crop surpluses, rather than by reducing production, appear to have been vindicated. This is information that should be kept in mind for future use.

Of more immediate moment is the fact that the country has been rudely awakened to the realization that a serious food problem is staring it in the face. Fortunately those entrusted with the prosecution of our war effort are aware of the situation and are taking steps to meet it. The approaches being made or given consideration are indicated in a recent address by Dr. Sherman E. Johnson, Chief of the Production Programs Branch of the Food Production Administration, before the annual meeting of the Western Farm Economics Association at Berkeley, California. While the address represented the speaker's personal views, they are important because of his position in the Food Production Administration.

Dr. Johnson said in part: "In building a wartime food production program we need, first of all, to consider the pattern of food needs. Second, we should analyze the most economical food sources for meeting each of these needs, and their priorities in event that some needs cannot be met. Third, we should determine what constitutes maximum production in accordance with the needed pattern. And, fourth, we should develop the type of programs that are most likely to obtain maximum production."

It is brought out that the five types of foods are grains; fats and sugars; proteins such as meats, poultry, eggs, legumes, and nuts; milk and milk products; and vegetables and fruits. These types of foods must be balanced from the nutritional viewpoint and also in line with production possibilities. With feed reserves fast disappearing, emphasis will have to be shifted from meat production to

vegetable sources of proteins. Egg production is considered an economical utilization of feeds, while dairy products are efficient sources of human nutrient needs. In general, emphasis will have to be given to agricultural production which supplies the most nutrients for the land, labor, and materials used in their production. High protein and oil crops, white and sweet potatoes, vegetables, and wheat and food cereals should be encouraged, with the bulky and perishable crops produced as close to consumption centers as possible. Cotton in the Mississippi Valley is given as an example where nearly as much oil as from soybeans can be produced, along with long staple cotton, needed in the war effort.

Shifts in farming systems may have to be made, whereby greater production of the more urgently needed crops will be obtained. This is comparable to the conversion of the automobile industry to war production. Dr. Johnson stated in this regard: "If it is to be achieved to the extent necessary to meet our needs, we must be ready to pay for the conversion cost." The possibilities of such conversions are not to be underestimated. The increase of acreage in peanuts from 1.1 million acres in 1941 to 3.6 million acres in 1942 is cited as what can be done. Attention must be given to increasing output per unit of land, labor, and animal. Greater and more efficient use of fertilizer in this connection is mentioned. Estimates by a joint committee of the Bureau of Plant Industry, Soils, and Agricultural Engineering and Bureau of Agricultural Economics show that increases in yield of 5 to 25 per cent of major crops and plowable pastures could be obtained "if a strong national program were adopted to facilitate carrying out certain improved practices including greater use of fertilizer. If confined to individual crops, even larger increases could be obtained."

Little hope is held out for any great relief in year-round labor, but some additional seasonal labor probably can be mustered. Greatest possible efficiency in use of present available labor will have to be obtained.

Considering maximum potential agricultural production, Dr. Johnson stated: "If fairly effective measures can be taken to meet minimum needs for labor, machinery, and materials, it may be possible to increase food production as much as 6 to 8 per cent above the record production of 1942. This statement assumes average crop yields and balancing livestock production with current feed supplies. . . . More important than the actual increase in output would be the changing pattern of production if the pattern were shifted in the direction indicated above. It would mean that a much larger population could be fed adequately from the food output.

"If we could develop programs which would obtain wide adoption of improved practices it might be possible to increase total output another 5 to 10 per cent above 1942 levels."

Five possible program approaches for obtaining maximum agricultural production along desired lines were presented: uncontrolled prices; support prices and government assistance in providing labor, machinery, and other supplies; support prices, goals, material grants, and war risk insurance; production contracts; and production allocations. Arguments for and against each of these programs were briefly given. It would appear from reading Dr. Johnson's address that he rather favors the third program whereby prices are supported; assistance is given in obtaining labor and materials for cooperating farmers; goals would be set up for the country, section, and individual farms; and crop insurance would be provided to reduce the risk of individual farmers in growing certain desired crops. Apparently he believes the first two programs are inadequate and the last two extreme and difficult to administer.

Farm Prices of Farm Products*

	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
1910–14 Average	12.4	10.4	69.6	87.6	64.8	88.0	11.94	21.59	....
1920	32.1	17.3	249.5	175.7	144.2	224.1	21.26	51.73	....
1921	12.3	19.5	103.8	118.7	58.7	119.0	12.96	22.18	....
1922	18.9	22.8	96.7	104.8	58.5	103.2	11.68	35.04	....
1923	26.7	19.0	84.1	104.4	80.1	98.9	12.29	43.69	....
1924	27.6	19.0	87.0	137.0	91.2	110.5	13.28	38.34	....
1925	22.1	16.8	113.9	171.6	99.9	151.0	12.54	35.07	....
1926	15.1	17.9	185.7	156.3	69.9	135.1	13.06	27.20	....
1927	15.9	20.7	132.3	114.0	78.8	120.5	12.00	28.56	....
1928	18.6	20.3	82.9	112.3	89.1	113.4	10.63	37.70	....
1929	17.7	18.6	93.7	118.4	87.6	102.7	11.56	34.98	....
1930	12.4	12.9	124.4	115.8	78.0	80.9	11.31	26.25	....
1931	7.6	8.2	72.7	92.9	49.8	48.8	9.76	17.04	....
1932	5.8	10.5	43.3	57.2	28.1	38.8	.53	9.74	....
1933	8.1	12.9	66.0	59.4	36.5	58.1	6.81	12.32	....
1934	12.0	17.1	68.0	79.1	61.3	79.8	10.67	26.12	....
1935	11.6	16.1	49.4	73.9	77.4	86.4	10.57	35.56	....
1936	11.7	17.2	99.6	85.3	76.7	96.0	8.93	31.78	....
1937	11.1	19.9	88.3	91.8	94.8	107.1	10.36	30.24	....
1938	8.3	17.2	55.5	76.9	49.0	66.1	7.55	21.13	....
1939	8.7	13.6	68.1	75.4	47.6	63.6	6.95	22.17	....
1940	9.6	15.1	70.7	85.2	59.0	73.9	7.62	24.31	....
1941	13.3	19.1	64.6	94.4	64.3	84.0	8.10	35.04	....
1942	18.51	28.3	110.0	108.3	79.5	101.8	10.05	44.42	....
May	19.17	21.3	114.8	105.6	81.4	99.8	10.82	43.99	....
June	18.26	30.2	111.1	108.6	81.9	95.7	10.00	43.87	....
July	18.55	31.0	125.8	112.2	83.1	94.6	9.05	43.20	....
August	18.03	33.5	115.4	137.3	83.4	95.4	8.89	44.04	....
September	18.59	35.1	107.7	120.5	82.6	102.6	9.03	45.33	....
October	18.87	42.3	102.5	107.9	77.5	103.5	9.39	46.46	....
November	19.22	39.8	108.4	103.5	75.9	104.4	9.84	45.01	....
December	19.55	40.0	111.8	110.3	80.2	110.3	10.46	44.72	....
1943									
January	19.74	35.1	117.8	121.4	88.0	117.5	11.20	44.34	....
February	19.68	18.2	125.7	129.8	90.4	119.5	11.94	44.88	....
March	19.91	16.0	145.1	153.6	94.8	122.7	12.28	45.73	....
April	20.13	16.0	166.8	179.2	100.2	122.3	12.61	45.89	....
May	20.09	37.6	190.7	225.1	103.4	122.8	12 66	46.11	....

Index Numbers (1910-14 = 100)

1920	259	166	358	201	223	255	178	240	....
1921	99	187	149	136	91	135	109	103	....
1922	152	219	139	120	90	117	98	162	....
1923	215	183	121	119	124	112	103	202	....
1924	223	183	125	156	141	126	111	177	150
1925	178	161	164	196	154	172	105	162	153
1926	122	172	267	178	108	154	109	126	143
1927	128	199	190	130	122	137	101	132	121
1928	150	192	119	128	138	129	89	175	159
1929	143	179	135	135	135	117	97	162	149
1930	100	124	179	132	120	92	95	122	140
1931	61	79	104	106	77	55	82	79	117
1932	47	101	62	65	43	44	63	45	102
1933	65	124	95	68	56	66	57	57	105
1934	97	164	98	90	95	91	89	121	104
1935	94	155	71	84	119	98	89	165	126
1936	94	165	143	97	118	109	75	147	113
1937	90	191	127	105	146	122	87	140	122
1938	67	165	80	88	76	75	63	98	101
1939	70	131	98	86	73	72	58	103	109
1940	78	145	102	97	91	84	64	126	121
1941	107	184	93	108	99	95	68	162	145
1942	149	272	158	124	123	116	84	206	199
May	155	205	165	121	126	113	91	204	152
June	147	290	160	124	126	109	84	203	169
July	150	298	181	128	128	108	76	200	200
August	145	322	166	157	129	108	74	204	256
September	150	338	155	138	127	117	76	210	191
October	152	407	147	123	120	118	79	215	226
November	155	383	156	118	117	119	82	208	238
December	158	385	161	126	124	125	88	207	293
1943									
January	159	338	169	139	136	134	94	205	277
February	159	175	181	148	140	136	100	208	301
March	161	154	208	175	146	139	103	212	302
April	162	154	240	205	155	139	106	213	291
May	162	362	274	257	160	140	106	214	253

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11-12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Fish scrap, wet acidulated, 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16-17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.05	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	3.54	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.25	4.59	5.16
1924	2.99	2.44	5.87	5.02	4.41	3.60	4.25
1925	3.11	2.47	5.41	5.34	4.71	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.15	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.35	4.32	5.70
1928	2.67	2.30	7.06	6.63	5.28	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.69	4.61	5.72
1930	2.47	1.81	4.78	4.96	4.15	3.79	4.58
1931	2.34	1.46	3.10	3.95	3.33	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.82	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.58	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.84	2.67	3.27
1935	1.47	1.15	4.59	3.10	2.65	3.06	3.65
1936	1.53	1.23	4.17	3.42	2.67	3.58	4.25
1937	1.63	1.32	4.91	4.66	3.65	4.04	4.30
1938	1.69	1.38	3.69	3.76	3.17	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.12	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.35	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.27	3.76	4.43
1942	1.74	1.41	6.11	5.77	3.34	5.04	6.76
May	1.75	1.41	6.29	5.77	3.34	5.46	6.97
June	1.75	1.41	5.23	5.77	3.34	4.98	6.94
July	1.75	1.41	5.99	5.77	3.34	4.86	6.80
August	1.75	1.42	5.77	5.77	3.34	4.86	6.94
September	1.75	1.42	5.69	5.77	3.34	4.86	6.97
October	1.75	1.42	5.72	5.77	3.34	4.86	6.80
November	1.75	1.42	6.06	5.77	3.34	4.86	6.53
December	1.75	1.42	5.68	5.77	3.34	4.86	6.53
1943							
January	1.75	1.42	5.68	5.77	3.34	4.86	6.53
February	1.75	1.42	5.83	5.77	3.34	4.86	6.53
March	1.75	1.42	6.30	5.77	3.34	4.86	6.53
April	1.75	1.42	6.29	5.77	3.34	4.86	6.53
May	1.75	1.42	6.29	5.77	3.34	4.86	6.53

Index Numbers (1910-14 = 100)

1922	113	90	173	132	117	140	142
1923	112	102	177	137	140	136	147
1924	111	86	168	142	145	107	121
1925	115	87	155	151	155	117	135
1926	113	84	126	140	136	129	139
1927	112	79	145	166	143	128	162
1928	100	81	202	188	173	146	170
1929	96	72	161	142	154	137	162
1930	92	64	137	141	136	112	130
1931	88	51	89	112	109	63	70
1932	71	36	62	62	60	36	39
1933	59	39	84	81	85	97	71
1934	59	42	127	89	93	79	93
1935	57	40	131	88	87	91	104
1936	59	43	119	97	89	106	121
1937	61	46	140	132	120	120	122
1938	63	48	105	106	104	93	100
1939	63	47	115	125	102	115	111
1940	63	48	133	124	110	99	96
1941	63	49	157	151	107	112	126
1942	65	49	175	163	110	150	192
May	65	49	180	163	110	162	198
June	65	49	149	163	110	148	197
July	65	49	171	163	110	144	193
August	65	50	165	163	110	144	197
September	65	50	163	163	110	144	198
October	65	50	163	163	110	144	193
November	65	50	173	163	110	144	186
December	65	50	162	163	110	144	186
1943							
January	65	50	162	163	110	144	186
February	65	50	167	163	110	144	186
March	65	50	180	163	110	144	186
April	65	50	180	163	110	144	186
May	65	50	180	163	110	144	186

Wholesale Prices of Phosphates and Potash**

	Superphosphate Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports	Kainit, 20% bulk, per unit, c.i.f. Atlantic and Gulf ports
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657	$0.655
1922	.566	3.12	6.90	.632	.904	23.87	....	.508
1923	.550	3.08	7.50	.588	.836	23.32	....	.474
1924	.502	2.31	6.60	.582	.860	23.72	....	.472
1925	.600	2.44	6.16	.584	.860	23.72	....	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537	.524
1927	.535	3.09	5.50	.646	.924	25.55	.586	.581
1928	.580	3.12	5.50	.669	.957	26.46	.607	.602
1929	.609	3.18	5.50	.672	.962	26.59	.610	.605
1930	.542	3.18	5.50	.681	.973	26.92	.618	.612
1931	.485	3.18	5.50	.681	.973	26.92	.618	.612
1932	.458	3.18	5.50	.681	.963	26.90	.618	.591
1933	.434	3.11	5.50	.662	.864	25.10	.601	.565
1934	.487	3.14	5.67	.486	.751	22.49	.483	.471
1935	.492	3.30	5.69	.415	.684	21.44	.444	.488
1936	.476	1.85	5.50	.464	.708	22.94	.505	.560
1937	.510	1.85	5.50	.508	.757	24.70	.556	.607
1938	.492	1.85	5.50	.523	.774	25.17	.572	.623
1939	.478	1.90	5.50	.521	.751	24.52	.570	.607
1940	.516	1.90	5.50	.517	.730	....	.573	....
1941	.547	1.94	5.64	.522	.748	25.55	.570	....
1942	.600	2.13	6.29	.522	.748	25.74	.205	....
May	.600	2.20	6.50	.535	.755	26.00	.210	....
June	.600	2.20	6.50	.471	.665	22.88	.185	....
July	.600	2.20	6.50	.503	.755	26.00	.197	....
August	.600	2.20	6.50	.503	.755	26.00	.197	....
September	.600	2.20	6.50	.503	.755	26.00	.197	....
October	.600	2.10	6.20	.535	.755	26.00	.210	....
November	.600	2.00	5.90	.535	.755	26.00	.210	....
December	.600	2.00	5.90	.535	.755	26.00	.210	....
1943								
January	.600	2.00	5.90	.535	.755	26.00	.210	....
February	.600	2.00	5.90	.535	.755	26.00	.210	....
March	.608	2.00	5.90	.535	.755	26.00	.210	....
April	.640	2.00	5.90	.535	.755	26.00	.210	....
May	.640	2.00	5.90	.535	.755	26.00	.210	....

Index Numbers (1910-14 = 100)

1922	106	87	141	89	95	99	....	78
1923	103	85	154	82	88	96	....	72
1924	94	64	135	82	90	98	....	72
1925	110	68	126	82	90	98	..	74
1926	112	88	114	83	90	98	82	80
1927	100	86	113	90	97	106	89	89
1928	108	86	113	94	100	109	92	92
1929	114	88	113	94	101	110	93	92
1930	101	88	113	95	102	111	94	93
1931	90	88	113	95	102	111	94	93
1932	85	88	113	95	101	111	94	90
1933	81	86	113	93	91	104	91	86
1934	91	87	116	68	79	93	74	72
1935	92	91	117	58	72	89	68	75
1936	89	51	113	65	74	95	77	85
1937	95	51	113	71	79	102	85	93
1938	92	51	113	73	81	104	87	95
1939	89	53	113	73	79	101	87	93
1940	96	53	113	72	77	..	87	....
1941	102	54	116	73	78	106	87	....
1942	112	59	129	73	78	106	84	....
May	112	61	133	75	79	108	85	....
June	112	61	133	66	70	95	81	....
July	112	61	133	70	79	108	83	....
August	112	61	133	70	79	108	83	....
September	112	61	133	70	79	108	83	....
October	112	58	127	75	79	108	85	....
November	112	55	121	75	79	108	85	....
December	112	55	121	75	79	108	85	....
1943								
January	112	55	121	75	79	108	85	....
February	112	55	121	75	79	108	85	....
March	113	55	121	75	79	108	85	....
April	119	55	121	75	79	108	85	....
May	119	55	121	75	79	108	85	....

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer materials‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash
1922.....	132	149	141	116	101	145	106	85
1923.....	142	152	147	114	107	144	103	79
1924.....	143	152	143	103	97	125	94	79
1925.....	156	157	151	112	100	131	109	80
1926.....	145	155	146	119	94	135	112	86
1927.....	139	153	139	116	89	150	100	94
1928.....	149	155	141	121	87	177	108	97
1929.....	146	153	139	114	79	146	114	97
1930.....	126	145	126	105	72	131	101	99
1931.....	87	124	107	83	62	83	90	99
1932.....	65	107	95	71	46	48	85	99
1933.....	70	109	96	70	45	71	81	95
1934.....	90	123	109	72	47	90	91	72
1935.....	108	125	117	70	45	97	92	63
1936.....	114	124	118	73	47	107	89	69
1937.....	121	130	126	81	50	129	95	75
1938.....	95	122	115	78	52	101	92	77
1939.....	93	121	112	79	51	119	89	77
1940.....	98	122	115	80	52	114	96	77
1941.....	122	130	127	86	56	130	102	76
1942.....	157	152	144	92	57	161	112	76
May.....	152	152	144	94	57	169	112	78
June.....	151	152	144	90	57	151	112	69
July.....	154	152	144	91	57	157	112	74
August....	163	153	145	91	57	155	112	74
September.	163	154	145	91	57	154	112	74
October...	169	155	145	92	57	154	112	78
November.	169	156	146	92	57	158	112	78
December..	178	158	147	92	57	154	112	78
1943								
January...	182	160	149	92	57	154	112	78
February..	178	162	149	92	57	155	112	78
March....	182	163	150	93	57	160	113	78
April.....	185	165	151	95	57	160	119	78
May.....	187	166	152	95	57	160	119	78

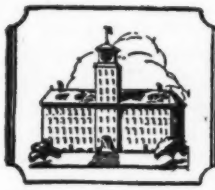
* U. S. D. A. figures.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.

**** The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**



REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Data from additional states on fertilizer usage and consumption have been received recently. A summary of fertilizers sold in Pennsylvania in 1942 has been issued by the Department of Agronomy of Pennsylvania State College which made a survey in cooperation with the National Fertilizer Association. This showed that over 380,000 tons of fertilizer were used in the State, over 280,000 representing mixed fertilizers and the remaining approximately 100,000 tons straight materials, most of which was superphosphate. The 15 leading grades were 0-20-0, 3-12-6, 0-14-7, 2-12-6, 4-8-8, 0-12-12, 2-9-5, 0-18-0, 0-16-0, 4-16-4, 2-8-10, 5-10-5, 5-10-10, 2-12-4, and 4-12-4. These grades comprised over 86% of all the tonnage listed. About 65% of the fertilizer was sold in the spring and 35% in the fall.

¶ Data for Wisconsin are given in Wisconsin State Department of Agriculture Bulletin No. 239, "Commercial Fertilizers—1943," by W. B. Griem. Very complete information on fertilizer consumption in this State is given in this publication. It shows that total consumption in 1942 was over 132,000 tons, by far the greatest tonnage of any year listed. Some idea as to the increase in tonnage in this State may be gained from the fact that in 1909, the first year figures are given, the total was only 1,500 tons. The concentration of plant food during the year was slightly less than the previous year, undoubtedly reflecting the disappearance from the market of some of the more concentrated fertilizer materials. The average analysis of all fertilizer sold was 1.52% nitrogen, 15.27% phosphoric acid, and 8.29% potash, or a total of 25.08% plant food. Forty-seven grades of mixed fertilizer were listed in addition to superphosphate and other materials. The leading grades were 2-12-6, 0-20-0, 3-12-12, 0-14-14, 0-20-10, 3-18-9, 0-19-0, 3-14-6, 0-20-20, and 3-9-18. These 10 leading grades represented about 81% of the total tonnage sold.

¶ The Department of Agronomy at the University of Illinois has issued mimeographed pamphlet AG1136, "Fertilizers Sold in Illinois in 1942." Forty-eight analyses of mixed fertilizer in addition to superphosphate and other materials were sold. Over 83,000 tons of fertilizer were used in the State, not counting an estimated 129,000 tons of rock phosphate. About 70% of the fertilizer was used in the spring and 30% in the fall. The 19 leading grades used comprised 95.75% of mixed fertilizers sold, and the average analysis given for the 10 leading grades was 1.6% nitrogren, 11.5% phosphoric acid, and 10.5% potash. The leading grades in order were 2-12-6, 0-12-12, 3-12-12, 0-20-0, 2-8-16, 0-14-7, 0-8-24, 2-16-8, sulphate of ammonia, 4-8-6, 0-18-0, and 10-6-4.

¶ In Indiana, preliminary figures on 1942 tonnages have been issued by the Agronomy Department of Purdue University in mimeographed sheets entitled, "Fertilizer Tonnage Sold in Indiana in 1942 as Reported by Fertilizer Manufacturers." Over 300,000 tons of fertilizer were reported with about ⅔

used in the spring and ⅓ in the fall. Nearly 100 mixed-fertilizer grades were reported in addition to straight nitrogen, phosphate, and potash materials. The leading grades were 0-12-12 and 2-12-6, far ahead of any others, followed by 0-14-7, 0-20-0, 0-20-20, 0-8-24, 3-12-12, 0-14-6, 0-14-14, 2-12-12, 2-8-16, raw rock phosphate, sulphate of ammonia, and 0-10-20. These 14 fertilizers comprise nearly 89% of the total tonnage reported.

"Fertilizer Recommendations for Wartime in Arkansas," Ext. Serv., Univ. of Ark., Fayetteville, Ark., Charles F. Simmons.

"Effect of Commercial Fertilizers on Performance of Peach Trees," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 429, March 1943, J. R. Cooper.

"Bureau of Chemistry Announcement Nos. FM-61 and 62," Dept. of Agr., State of Calif., Sacramento, Calif.

"Commercial Fertilizers," Agr. Exp. Sta., New Haven, Conn., Bul. 467, Nov. 1942, E. M. Bailey.

"More Crops with Less Fertilizer," Ext. Serv., Univ. of Conn., Storrs, Conn., Bul. 340, Feb. 1943, J. S. Owens.

"Commercial Fertilizers," Ga. Dept. of Agr., Atlanta, Ga., Serial No. 127, Jan. 1943.

"Food Production for War," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, War Cir. 13, G. Orien Baker.

"Fertilizers Sold in Illinois in 1942," Dept. of Agron., Univ. of Ill., Urbana, Ill., March 1943.

"Fertilizer Tonnage Sold in Indiana in 1942 as Reported by Fertilizer Manufacturers," Dept. of Agron., Purdue Univ., Lafayette, Ind.

"Report of Analysis of Commercial Fertilizers," La. Dept. of Agr. and Immigration, La. State Univ., Univ. Station, Baton Rouge, La., 1941-1942.

"Farming with Less Fertilizer," Ext. Serv., Mass. State College, Amherst, Mass., Sp. Cir. 93, March 1943.

"1943 Wartime Fertilizers," Ext. Serv., Mass State College, Amherst Mass., Sp. Cir. 95, March 1943, Ralph W. Donaldson.

"Results of Cooperative Fertilizer Experiments on Corn in McLeod County in 1942," Univ. Farm, Univ. of Minn., St. Paul, Minn., Soil Series No. 1, Jan. 1943, C. O. Rost, Paul M. Burson, and R. E. Jacobs.

"Results of Cooperative Fertilizer Experiments on Corn in Martin County in 1942," Univ. Farm, Univ. of Minn., St. Paul, Minn., Soil Series No. 2, C. O. Rost, Paul M. Burson, and Stanley Simpson.

"Results of Cooperative Fertilizer Experiments on Corn in Cottonwood County in 1942," Univ. Farm, Univ. of Minn., St. Paul, Minn., Soil Series No. 3, Jan. 1943, C. O. Rost, Paul M. Burson, and E. C. Rogers.

"Phosphate Fertilizer Results in Minnesota," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., E. Pamp. 121, April 1943, Paul M. Burson, C. O. Rost, C. M. Kelehan, and M. L. Armour.

"Complete Fertilizer Needed by Soils of South Mississippi," Agr. Exp. Sta., State College, Miss., Inf. Sheet 283, Dec. 1942, Russell Coleman.

"Fertilizer Recommendations for 1943," Agr. Exp. Sta., State College, Miss., Inf. Sheet 286, Jan. 1943, Clarence Dorman.

"Commercial Fertilizers and Winter Legumes for Cotton Production: Barksdale Field, Quitman County," Agr. Exp. Sta., State College, Miss., Service Sheet No. 347, Dec. 1942, Roy Kuykendall.

"Commercial Fertilizers for Cotton Production: Gary Field, Tallahatchie River Soil," Agr. Exp. Sta., State College, Miss., Service Sheet No. 348, Dec. 1942, Roy Kuykendall.

"Commercial Fertilizers and Winter Legumes for Cotton Production: Schaefer Field, Yazoo County," Agr. Exp. Sta., State College, Miss., Service Sheet No. 350, Dec. 1942, Roy Kuykendall.

"The Value of Farm Manure," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 248, Jan. 1943, G. E. Smith.

"Fertilizers for Sweet Corn," Agr. Exp. Sta., Univ. of N. H., Durham, N. H., Cir. 63, Feb. 1943, Ford S. Prince and Paul T. Blood.

"Starter Solutions for Tomato Plants for 1943," N. Y. State Agr. Exp. Sta., Geneva, N. Y., Bul. 706, May 1943, Charles B. Sayre.

"Fertilizers Sold in Pennsylvania in 1942," Dept. of Agron., Pa. State College, State College, Pa.

"The 1943 Fertilizer Situation," Ext. Serv., Clemson College, Clemson, S. C., H. A. Woodle.

"Commerical Fertilizers—1943," Wis. State Dept. of Agr., Madison, Wis., May 1943, W. B. Griem.

Soils

¶ Three bulletins on soil conservation of interest to those concerned with this important subject are listed this month. U. S. Department of Agriculture Farmers' Bulletin No. 1853, "Classifying Land for Conservation Farming," by R. D. Hockensmith and J. G. Steele, describes the various types of land recognized by the Soil Conservation Service, the types of erosion likely to be found on them, methods of control, and how the various classes of soil can best be utilized. The publication is well illustrated and an example is given

of the detailed consideration given to crops, soil treatment, including fertilization and liming, pasturing, and other practices concerned with the utilization of the land.

¶ "Does Soil Conservation Pay?" is the title of Bulletin 459 of the Wisconsin Agricultural Experiment Station. It describes the remarkable results that have been obtained on taking a badly run-down and eroded property in Wisconsin, applying soil conservation methods, and measuring the results in terms of crops produced. It is stated that during the first two years the farm was taken over, the stock had to be cut to 6 cows and 2 horses in order to do a good job of feeding and even then forage produced had to be supplemented with purchase of feed. After contour farming, erosion-control measures, and fertilization with 0-20-20 and lime had been used, yields were increased so that now the farm supports 21 milch cows, 4 heifers, 6 calves, and 2 horses without the purchase of any additional feed.

¶ Practical information on how to institute and carry out strip-crop farming is contained in Iowa Agricultural Extension Bulletin P53 entitled, "Following the Contour," by J. B. Peterson and L. E. Clapp. Here again the publication is well illustrated and diagrammed so that anyone wishing to adopt contour farming will find easily understandable directions.

"Verticle Zonation of Great Soil Groups on Mt. Graham, Arizona, as Correlated with Climate, Vegetation, and Profile Characteristics," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., T. Bul. 99, Jan. 1, 1943, W. P. Martin and Joel E. Fletcher.

"Your Soil Needs Defending Too!" Ext. Serv., Idaho Univ., Moscow, Idaho, Def. Cir. 16, Jan. 1942, Arnold E. Poulson.

"Soil Conservation Districts in Indiana," Agr. Ext., Purdue Univ., Lafayette, Ind., E. Leaf. 233, Oct. 1942, R. O. Cole.

"Following the Contour," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Bul. P53, Feb. 1943, J. B. Peterson and L. E. Clapp.

"Liming Soils," Ext. Serv., Mass State College, Amherst, Mass., Leaf. 134, (Rev.), Feb. 1943, Ralph W. Donaldson and Arthur B. Beaumont.

"Soil Fertility Control for Greenhouses," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Sp. Bul. 325, May 1943, C. H. Spurway.

"Work in Progress in the Division of Soils," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., Soil Series No. 4, Jan. 1943, C. O. Rost.

"Making Garden Soils Productive," Agr. Ext. Div., Univ. of Minn., Univ. Farm, St. Paul, Minn., Soil Series No. 6, March 1943, Paul M. Burson and C. O. Rost.

"Cropping Systems and Soil Fertility," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 247, Dec. 1942, G. E. Smith.

"Soils of Wheatland County," Agr. Exp. Sta., Montana State College, Bozeman, Mont., Bul. 409, Feb. 1943, L. F. Gieseker.

"The Geographic Distribution of Azotobacter and Rhizobium meliloti in Nebraska Soils in Relation to Certain Environmental Factors," Agr. Exp. Sta., Univ. of Neb., Lincoln, Neb., R. Bul. 121, June 1941, H. B. Peterson and T. H. Goodding.

"Does Soil Conservation Pay?" Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Bul. 459, March 1943.

"Classifying Land for Conservation Farming," U. S. D. A., Washington, D. C., F. B. 1853, Feb. 1943, R. D. Hockensmith and J. G. Steele.

Crops

¶ The enthusiasm of several years ago over the apparently enormous possibilities in growing crops in culture solutions of various kinds fortunately has passed and seems to have been replaced by a much saner enthusiasm in victory gardens. This does not mean that there is no place for solution culture of crops, but it now appears as though that place is being found and the technique is being applied on a reasonable basis. Those now employing or contemplating the use of the culture solution technique will be interested in a new publication issued by Purdue University Agricultural Experiment Station, Circular 277, "Nutrient Solution Culture of Greenhouse Crops," by R. B. Withrow, J. P. Biebel and T. M. Eastwood. The authors are among the earliest investigators of this technique in the country and out of their experience are able to furnish much helpful and practical information backed by thorough trial and experimentation. The different types of culture solutions with their advantages and disadvantages are briefly discussed. Sub-irrigation culture, with apparatus and installation,

is described in detail. The section on the preparation and management of the nutrient solution is very complete and will be found extremely useful by those using this method.

¶ Tobacco diseases are very completely covered in Kentucky Agriculture Experiment Station Bulletin 437 entitled "Tobacco Diseases," by W. D. Valleau, E. M. Johnson, and Stephen Diachun. The diseases are grouped into six different classes based on the cause of the trouble, as fungi, bacteria, virus diseases, nematodes, parasitic plants, and physiological diseases. There is also a grouping based on the parts of the plant affected. The disease and the damage it does are described, the cause of the disease so far as known is stated, and practical information on the prevention and control is given in each case.

Under physiological diseases, attention is given primarily to deficiencies of nitrogen, phosphorus, potassium, and sulphur. The appearance of the plant for each nutrient deficiency is described and in some cases illustrated. It is stated that calcium and magnesium deficiencies very seldom occur under Kentucky conditions. The obvious control of such diseases is the application of nutrients by means of fertilizer, manure, or in the case of nitrogen—legume green manure. In most of the soils of Kentucky, phosphorus is likely to be deficient and will be needed in the fertilizer. It is stated that in 1941 a survey indicated that over half the soils in central Kentucky and most fields in other sections were too low in available potash to produce a satisfactory crop. Potash starvation is more likely to occur on limed than unlimed soil. Where potash is deficient in the presence of an abundance of nitrogen, the tobacco is apt to be red. In discussing plant-bed diseases, growers are warned against using too heavy an application of fertilizer. In connection with leaf spot diseases, the authors emphasize the importance of having a high level of available nutrients, particularly potash, in the soil so as to build up the resistance of the plant and thus reduce leaf-spot injuries to a minimum. While the bulletin is written for Kentucky conditions, all tobacco growers will find the information of value.

"Grow a Garden in Alaska," Ext. Serv., Univ. of Alaska, College, Alaska, E. Cir. 1, Feb. 7, 1942.

"Cultivated Grasses and Legumes in Alaska," E. Serv., Univ. of Alaska, College, Alaska, E. Cir. 2, April 20, 1942.

"Fifty-Third Annual Report for the Year Ending June 30, 1942, Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Jan. 1, 1943.

"Eradication and Control of Nut Grass," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 189, March 1943, C. H. Davis and R. S. Hawkins.

"Growing and Handling Garlic in California," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Cir. 84, (Rev. Nov. 1942), Roy D. McCallum, (Rev.) by J. E. Knott.

"Report of the Department of Agriculture for the Year Ended Nov. 30, 1941," Halifax, Nova Scotia, 1942.

"Report of the Department of Agriculture for the Year Ended Nov. 30, 1942," Halifax, Nova Scotia, 1943.

"Annual Report for the Year Ending October 31, 1942," Conn. Agr. Exp. Sta., New Haven, Conn., Bul. 468, March 1943.

"How Connecticut Nurserymen Can Aid in Food Production," Conn. Agr. Exp. Sta., New Haven, Conn., Cir. 154, March 1943.

"Growing Potatoes in War Time," Conn. Agr. Exp. Sta., New Haven, Conn., Cir. 156, April 1943.

"Dairy Farm Primer," Ext. Serv., Univ. of Conn., Storrs, Conn., Bul. 334, Sept. 1942, A. I. Mann.

"Vegetable Gardening for Victory," Ext. Serv., Univ. of Del., Newark, Del., W. E. Folder No. 5, Feb. 1943, E. P. Brasher.

"Increasing Tomato Yields by Profitable Cultural Practices," Ext. Serv., Univ. of Del., Newark, Del., W. E. Folder No. 6, March 1943, E. P. Brasher.

"Lespedeza for Permanent and Temporary Pastures, Hay, Seed, Soil Conservation and Improvement," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., E. Cir. 307, Feb. 1943, E. D. Alexander.

"Peanut Culture in Georgia," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., E. Cir. 309, March 1943, E. D. Alexander.

"Soybeans in Georgia," Agr. Ext. Serv., Univ. of Ga., Athens, Ga., E. Cir. 310, April 1943, E. D. Alexander.

"Suggestions for Growing Sweet Potatoes for Dehydration," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper No. 20, March 1943.

"Seed-Piece Method of Planting Sweet Potatoes," Ga. Coastal Plain Exp. Sta., Tifton, Ga., Mimeo. Paper No. 21, March 1943.

"Vegetation Zones of Hawaii," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, Bul. 89, 1942, J. C. Ripperton and E. Y. Hosaka.

"Mobilizing Idaho Forage Resources," Ext. Serv., Univ. of Idaho, Moscow, Idaho, Def. Cir. 34, Dec. 1942.

"Growing Strawberries in Idaho," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Bul. 249, Dec. 1942, Leif Verner.

"Castor Beans—An Industrial War Crop," Ext. Serv., Univ. of Ill., Urbana, Ill., E. Cir. 551, April 1943, R. F. Fuelleman and W. L. Burlison.

"Supplementing and Improving Dairy Pastures," Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 553, March 1943, W. B. Nevens.

"1942 Report of the Muscatine Island Field Station," Ext. Serv., Iowa State College, Ames, Iowa, Victor E. Hollar.

"Kansas Corn Tests, 1942," Agr. Exp. Sta., Kansas State College, Manhattan, Kansas, Bul. 311, Jan. 1943, R. W. Jugenheimer, A. L. Clapp, and H. D. Hollembeak.

"Annual Report of the Director of Agricultural Extension," Ext. Serv., Univ. of Ky., Lexington, Ky., Cir. 380, Dec. 31, 1941, T. R. Bryant.

"Late-Cut Vs. Early-Cut Soybean Hay for Stocker Cattle," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 435, Sept. 1942, E. S. Good.

"Tobacco Diseases," Agr. Exp. Sta., Univ. of Ky., Lexington, Ky., Bul. 437, Dec. 1942, W. D. Valleau, E. M. Johnson, and Stephen Diachun.

"Performance of Irish Potato Varieties in Louisiana," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 359, Jan. 1943, E. L. LeClerg.

"Station Miller Cotton," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Cir. 29, Jan. 1943, H. B. Brown.

"Grassland Experiments," Agr. Exp. Sta., Univ. of Maine, Orono, Me., Bul. 415, Feb. 1943, D. S. Fink.

"Science at Work for the Farmer," Agr. Exp. Sta., Univ. of Md., College Park, Md., Bul. No. A7, 1940-41, R. B. Corbett.

"The Performance of Hybrid Corn in 1942," Agr. Exp. Sta., Univ. of Md., Colege Park, Md., Mis. Publ. 12, Dec. 1942, R. G. Rothgeb and A. D. Hoadley.

"Suggested Field Corn Hybrids for Farm Use in Maryland 1942," Ext. Serv., Univ. of Md., College Park, Md., Mimeo. 2, Jan. 29, 1942 (Revised).

"Peach Growing in Massachusetts," Agr. Exp. Sta., Mass. State College, Amherst, Mass., Bul. 399, Jan. 1943, John S. Bailey.

"Plant Characters of Cherry Varieties," Agr. Exp. Sta., Mass. State College, Amherst, Mass., Bul. 401, Feb. 1943, A. P. French.

"Potato Growing," Ext. Serv., Mass. State College, Amherst, Mass., Leaf. 20, Feb. 1943, Ralph W. Donaldson, Oran C. Boyd, and Arthur I. Bourne.

"The Home Vegetable Garden," Ext. Serv., Mass. State College, Amherst, Mass., Leaf. 59, March 1943.

"Tomato Growing in Michigan," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Sp. Bul. 131 (2nd Revision), March 1943, S. B. Apple.

"The Minnesota Pasture Program," Agr. Ext. Div., Univ. of Minn., St. Paul, Minn., Soil Series No. 5, March 1943, Paul M. Burson.

"Grow More Legume Hay for More Livestock Products with Less Labor and Lower Cost," Ext. Serv., Miss. State College, State College, Miss., E. Leaf. 43 (19,500), Jan. 1943, J. M. Weeks.

"Sweet Potatoes for Home Consumption and Market," Ext. Serv., Miss. State College, State College, Miss., E. Leaf. 48 (19,500), March 1943, Chesley Hines.

"Long Staple Cotton Varieties, Mississippi, 1943," Agr. Exp. Sta., State College, Miss., Inf. Sheet. 285, Jan. 1943, Clarence Dorman.

"Peach Culture in Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 455, Sept. 1942, T. J. Talbert.

"Sanborn Field," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 458, Dec. 1942, G. E. Smith.

"Good Practices in Corn Planting and Cultivation," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 254, Feb. 1943, C. A. Helm.

"Wartime Service to Montana," Agr. Exp. Sta., Bozeman, Mont., War Cir. 2 (1943), S. C. Litzenberger.

"Selective Sprays for the Control of Lawn Weeds," Agr. Exp. Sta., Montana State College, Bozeman, Mont., Bul. 411, March 1943, S. C. Litzenberger and A. H. Post.

"Varieties of Farm Crops for Montana 1943," Agr. Exp. Sta., Montana State College, Bozeman, Mont., Cir. 171, March 1943.

"Fiber of Native Plants in New Mexico," Agr. Exp. Sta., N. M. College of Agr. & Mech. Arts, State College, N. M., Bul. 300 (Tech.), Feb. 1943, C. W. Botkin, L. B. Shires, and E. C. Smith.

"Experiments with Vegetables at the Conservancy District Substation," Agr. Exp. Sta., N. M. College of A. & M. Arts, State College, N. M., Bul. 302, March 1943, Rufus Stroud.

"Official Variety Tests in North Carolina 1942," Agr. Exp. Sta., N. C. State College of A. & E., State College Station, Raleigh, N. C. Agron. Inf. Cir. 131, Dec. 1942.

"Ohio Corn Performance Tests and Recommendations 1942," Ohio Agr. Exp. Sta., Wooster, Ohio, Sp. Cir. 66, Feb. 1943, G. H. Stringfield, R. D. Lewis, and H. L. Pfaff.

"Insure Legumes with Inoculation," Ohio Agr. Exp. Sta., Wooster, Ohio, Sp. Cir. 67, Feb. 1943, Harold W. Batchelor.

"Irish Potato Production in Oklahoma," Okla. Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-266, March 1943, H. B. Cordner.

"Some Newer Peach Varieties for South-central Pennsylvania," Agr. Exp. Sta., State

College, Pa., Bul. 442, Feb. 1943, C. O. Dunbar.

"The Cotton Contest—1942 for Better Yield and Staple Value," Clemson Agr. College, Clemson, S. C., Cir. 229, Feb. 1943.

"Agricultural Research in South Dakota," Agr. Exp. Sta., S. Dakota State College of A. & M. Arts, Brookings, S. D., 1942.

"Fifty-Fourth Annual Report 1941," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn.

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Sericea Is A Good Crop

(*From page* 17)

Sericea is also proving to be a good grazing crop. It is especially valuable for spring grazing when permanent pastures fail because of drought. Cattle and work animals have grazed sericea when they were turned on it while plants were succulent. They have not usually grazed sericea if turned on after plants were 12 inches or more in height. Farmers who have pastured sericea clipped it occasionally if plants reached a height of 12 inches. New growth following clipping was more palatable than the older growth. Sericea has also been grazed in the fall following summer mowing for hay.

The possibilities of sericea as a deep-rooted legume to control erosion and increase productivity of the soil in soil crop-conserving rotations have not been fully explored. Increases in crop yields following sericea in a few trials in the field have been very striking.

T. L. Smith, Route 5, Greer, S. C., plowed 1¼ acres of sericea and sowed barley in the fall of 1941. He fertilized the barley in the fall with 300 pounds of 4-8-6 fertilizer per acre and in the spring with 125 pounds of nitrate of soda per acre. The total yield of barley in 1942 was 120 bushels, or 96 bushels per acre.

Fertilizer Requirements

There is little definite information about the fertilizer requirements of sericea. It has grown vigorously without fertilizer on moderately productive soils. On some of the poorer soils, sericea has made unsatisfactory growth without fertilizer. Even on the better soils where it was not fertilized, the stands were often thinned and broomsedge encroached after sericea was harvested for hay over a period of 2 to 3 years. Applications of fertilizer have increased the vigor of plants in several depleted stands to such an extent that broomsedge that had come in was crowded out.

On very poor soils, applications of 400 to 600 pounds of superphosphate per acre have been very beneficial in getting stands well established. Little is known about the potash requirements of sericea, but it seems logical that on soils where potash deficiency is indicated by cotton rust or other signs of potash hunger, potash also will be needed. Nitrogen has been distinctly harmful when applied before planting, particularly on soils of moderate productivity. Nitrogen from manure, commercial fertilizer, or winter legumes turned before sericea was seeded has stimulated the growth of crab grass to such an extent that it has bedded down on the young sericea plants. This heavy layer of crab grass completely smothered sericea plants so that spots several square feet in area were bare the following year.

Lime has not been very generally used on land where sericea has been planted. Increased yields of hay have been obtained where lime was applied on very acid soils. It seems logical that sericea may respond to liming in about the same way as the annual lespedezas. Additional information about the fertilizer and lime requirements of sericea on the different soils is needed.

Although there has been a gratifying increase in the acreage planted to sericea during the past 10 years, there is still a need for many thousands of acres of this deep-rooted, hardy perennial. There is a very extensive acreage of eroded, depleted land in the Southeast that must be completely rehabilitated before it will make any substantial contribution to a better agriculture. Sericea has shown marked ability to grow on these depleted lands and to restore their productive capacity as hay, pasture, and cropland.

How Best Use Our Feed Crops?

(*From page* 12)

The answer seems to be that from the standpoint of making the best use of our available feed supplies it would be desirable to reduce livestock fattening operations, then hogs, and finally poultry, and increase milk production chiefly through heavier feeding. The extent to which such changes are necessary, Mr. Christensen reminds us, depends upon the urgency of increasing the output of food and upon the total quantity of feed supplies.

Putting Fertilizer Down Puts Crops Up

(*From page* 22)

the yields of soybeans on the limed land were larger by 7.3 bushels than on the unlimed land. On the unlimed land, the plowing under of the 0-20-10 fertilizer gave 6.9 more bushels of beans per acre. On the limed land, the increase from plowing was over 8 bushels per acre. Nitrogen in the fertilizer had a tendency to delay maturity, but to a lesser extent on the limed land. Nevertheless, the beans from all the plots contained less than 12% moisture.

In the similar study with corn in 1942, the plowing under of 200 pounds of 0-20-20 fertilizer per acre on second-year sweet clover land ahead of corn was responsible for an increase in yield of nearly 9 bushels per acre on Oswego silt loam. Similar applications put on the side of the row at corn planting time with a modern corn planter attachment failed to increase the yield materially. The corn receiving applications of fertilizer in the row grew more rapidly at the outset but failed to produce the yield equal to that where the fertilizer was plowed under as the data in Table 4 indicate.

Left, soybeans on limed land which received 200 lbs. of 0-20-10 per acre plowed under yielded 26.5 bu. per acre. Right, soybeans on limed land which received no fertilizer yielded but 17.3 bu. per acre.

TABLE 2.—YIELDS OF SOYBEAN GRAIN ON GERALD SILT LOAM, ACCORDING TO DIFFERENT AMOUNTS OF FERTILIZER, WERE PLOWED UNDER ON LIMED OR UNLIMED SOILS.

Grade and Rates/Acre	Bu./Acre	
	Limed	Unlimed
None	17.3 bu.	10.0 bu.
200# 0–20– 0	12.5 [1]	15.0
400# 0–20– 0	19.3	12.8
200# 0–20–10	26.5	19.0
400# 0–20–10	23.3	14.8
200# 0–20–20	23.6	
400# 0–20–20	25.6	
250# 4–16– 4	20.5	15.4
500# 4–16– 4	21.0	14.4

[1] One row was a border row.

The plots with no fertilizer produced 40.8 bushels per acre, while those with 200 pounds of 0-20-0 plowed under produced an average of 47.1 bushels per acre, in contrast to a yield of 42.2 bushels where a similar application was applied in the row. An application of 200 pounds per acre of 0-20-20 plowed under yielded 49.4 bushels per acre, as compared to 46 bushels when applied in the row. By increasing the amount to 400 lbs. per acre, the application plowed under did not increase the yield per acre.

TABLE 3.—YIELDS OF SOYBEAN GRAIN (BUSHELS/ACRE), ACCORDING TO THE FERTILIZER, WERE PLOWED UNDER OR APPLIED AS BANDS ALONG THE ROW ON LIMED OR UNLIMED SOIL.

Grade and Rate/Acre	Plowed Under	Bands
Limed		
None	17.3 bu.	17.3 bu.
200# 0–20– 0	19.3*	18.6
200# 0–20–10	26.5	17.4
Unlimed		
None	10.0 bu.	10.0 bu.
200# 0–20– 0	15.0	12.8
200# 0–20–10	13.0	10.7

* Weight included border row and could not be used. Yield record given is for 400 pounds broadcast and plowed under.

Hesitancy in putting money into plant nutrients to be buried in the soil has made us use limited amounts of purchased fertilizer salts in close contact with the seed. This was encouraged by our desire to make little fertilizer do much and in short order. We have not been ready to look at fertilizer purchases as long-time investments, nor as carryovers to the second, the third, and later crops. This short-sighted policy toward our soils has given us the apparent damaging salt effects of fertilizers in summer crops under serious moisture shortages.

TABLE 4.—YIELDS OF CORN GRAIN (BUSHELS/ACRE) ON OSWEGO SILT LOAM ACCORDING AS FERTILIZER WAS PLOWED UNDER OR APPLIED ALONG SIDE OF THE ROW.

Grade and Rate/Acre	Plowed Under	Along Row
None	40.8	40.8
200# 0–20– 0	47.6	42.2
400# 0–20– 0	46.7	.....
200# 0–20–10	44.7	42.2
400# 0–20–10	48.1	.....
200# 0–20–20	49.4	46.0
400# 0–20–20	49.4	.....
333# 2–12– 6	48.7	41.2
666# 2–12– 6	47.1	.....

If the effects of plowed-under fertilizers are a fair indication, as shown by the few trials, then they suggest that we must look to putting fertilizers onto the soil either long enough ahead of the crop, or down into the soil deep enough where there is enough moisture to permit them to change from the salt to the adsorbed form if the most regular benefits are to be obtained in spite of moisture irregularities.

In addition, in much of the humid area where the subsoil is so highly depleted of its nutrient bases as indi-

An application of 0-20-20 on limed land increased the yield of soybean seed nearly 7 bu. per acre.

cated by the high degree of acidity, the fertilizers will be much more efficient if used after the soil's calcium deficiency has been remedied by liming. Even a leguminous crop like soybeans, considered "acid-tolerant" by some, and the non-leguminous crop of corn have demonstrated this beneficial effect from lime in conjunction with fertilizer plowed under.

This greater economy in the joint use of more than one remedy for nutrient deficiencies and their wiser location in the deep and more moist areas of the soil at good distance from the seed can do much toward increased food supplies. They indicate that fertilizers are less effective as salts in solution than when first taken and later given by the soil to the plants, or when we fertilize the soil rather than fertilize the crop. We must in reality put the fertilizer down if we want to put the crops up to higher yield levels.

Why Do Farmers Plow?

(*From page* 26)

gradual exhaustion of the stores of fertility in a soil that must first feed the crop of bacteria within before these life forms can leave something for the crop above. Continued and excessive cropping, along with the product removal, reduce the output of the nutrients left over in soluble form by microbial activity. The microbes merely rework what is given them.

The nitrates, or the available forms of nitrogen, are brought down to a very low level in the soil in June by the wheat crop just before its harvest, Fig. 3. Early plowing in July for the next crop starts their accumulation in the soil again and the curve begins to rise. In the stubble soil the nitrates stay low. But when this stubble is plowed in August, this soil-stirring operation starts the nitrate supply upward. Delay in plowing until September lets the growing weeds reduce the nitrate supply in the soil even below that possible in ex-

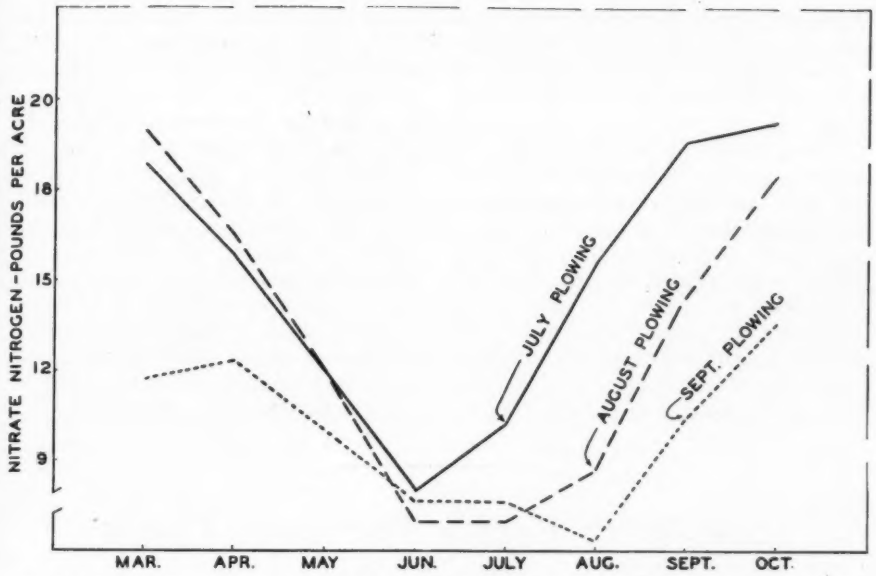


Fig. 3. Nitrate nitrogen levels in the soil under wheat reflect amounts and time of rise related to time of plowing.

haustion by the wheat crop. Here is a reason based on nutritional evidence that explains why late plowing for wheat makes it a poor crop, even when weeds are turned under as a green manure crop. For wheat, plowing in July makes a better crop, but the same operation in September makes a poorer one. Can we then blame the plow when the same performance in turning the soil is both good and bad for the crop, all within the short time of three months?

The microbial crop comes in for the explanation. The microbes must be fed first. They eat at the first table, the wheat at the second. Early plowing puts under little organic matter. It compels the bacteria to oxidize the humus of the soil that has already been worked over to the point where it has a narrow nutritive ratio, or a small amount of carbon as compared with its nitrogen. When bacteria get their energy, they burn much of the carbon and leave the soluble nitrogen to accumulate in the form of nitrates as nourishment for the wheat, to its better growth.

Late plowing that turns under weeds represents a case of feeding the bacteria with a diet of excessive carbon and of deficient nitrogen. The weeds that grew in the stubble after the wheat had taken most of the nitrogen couldn't be nitrogen-rich. They were carbon-rich or woody. Turned under, this excessive supply of carbon as energy material compels the microbes to use the soil nitrogen to balance their nutritional needs. They put this soluble nitrogen into complex, insoluble combinations resulting from weed decay. The wheat crop following finds little nitrate in the soil. It starves when in competition for such with the microbial life in the soil.

Under such circumstances, plowing may be given the blame by those who have never understood the bacteria in the soil. But certainly it isn't the plow. It is the deficient supply of soil fertility that is too low to make weeds that can contain much in the way of nutrients from the soil and must, therefore, be made from air and water coming from above the soil. Nutrients from that source can serve to make only woodiness. The fertility is also too low to

balance a woody or carbonaceous green manure as the main part of the microbial diet, and to leave anything in addition as nourishment for the wheat crop.

There are other scientific bases for plowing beside the aeration of the soil for the combustion or decomposition encouraged thereby as means of liberating plant nutrients within the soil. Many other phases of microbial life contribute to support the plow as an important agricultural implement. At various agricultural experiment stations, other scientists than microbiologists have given thought to the effects of incorporating organic matter into the soil by the plow and other methods. Basic soil information in connection with the "debacle in which our American soils have drifted" has been established by other men of science who man our various stations. They include those concerned with soil fertility, plant nutrition, soil mineralogy, colloid chemistry, animal physiology, soil, and other aspects of science not even considered as closely connected with soils at so recent a date as 1910. All these can support the farmer in his art of plowing and can give a scientific answer, even if he can't to the question "Why plow?"

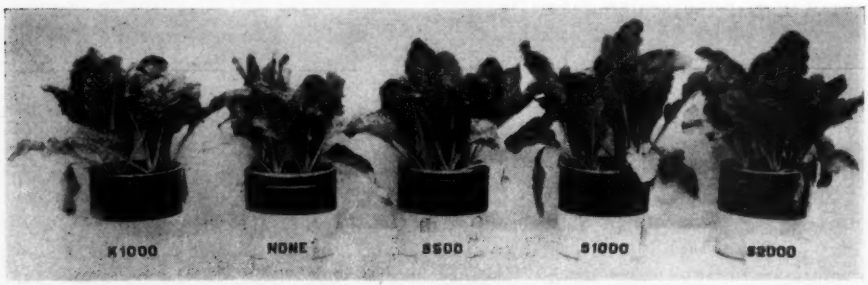
Salt With Potash For Some Crops

(*From page* 10)

taken into the tops and that the roots actually showed little increase in absorbed chlorides. This is of economic importance since it has been held that in the factory extraction of sugar from the sugar beets, a high content of chloride interferes with the proportion which can be recovered.

An application of 1,000 lbs. of salt per acre does not mean an excessive cost in a state like Michigan, which for many years has led in the production of salt. In some states far removed from salt mines, however, the cost of such a quantity of salt amounts to quite an item in the proper fertilization of the salt-responsive crops. In such locations it is important to note the benefits that were secured from kainite (Tables 1 and 2) which, with several crops, gave as high a yield as did 500 lbs. of salt applied in addition to the 0-8-24 fertilizer containing the higher-analysis potash.

The 1942 study of the effects of salt on crops, as mentioned before, included the application of the mine-run 25 per cent manure salts from the Carlsbad potash deposits, with the trials located on a virgin muck more than 20 feet deep. So poorly drained that this area had never burned over to any appreciable extent, this muck had produced an annual waist-high, wild growth of grass and weeds from time



Swiss chard produced in the greenhouse. In addition to a uniform application of 1,000 lbs. of 4-8-24 per acre, the jars received, from left to right, 1,000 lbs. muriate of potash: nothing; and salt 500, 1,000, and 2,000 lbs. per acre.

TABLE 4.—EFFECTS OF VARYING SALT AND POTASH APPLICATIONS TO MUCK SOIL ON THE SODIUM AND CHLORIDE ABSORPTION BY CROPS

Order of plots	Fertilized annually 600 lbs. per acre 1932–37	Annual salt application 1932–37 lbs. per acre	Crop yield 1937 tons per acre	Per cent on water free basis		Ratio soda to chloride
				Soda (Na_2O)	Chloride (Cl)	
Sugar beets—tops						
1, 6, 11	0–8–24	0	4.8	0.59	1.33	0.44
3, 8, 10	0–8–24	500	5.5	1.78	2.14	0.83
5	0–8–24	1000	4.5	2.05	2.22	0.92
7, 9	0–8–24 (Kainite)	0	5.8	1.17	1.73	0.68
Sugar beets—roots						
1, 6, 11	0–8–24	0	5.1	0.25	0.25	1.00
3, 8, 10	0–8–24	500	7.9	0.58	0.29	2.00
5	0–8–24	1000	7.7	0.41	0.24	1.71
7, 9	0–8–24 (Kainite)	0	7.5	0.45	0.17	2.65
Celery						
1, 6, 11	0–8–24	0	18.2	0.89	3.40	0.26
3, 8, 10	0–8–24	500	26.1	3.52	4.80	0.74
5	0–8–24	1000	25.6	3.93	5.65	0.69
7, 9	0–8–24 (Kainite)	0	28.1	3.09	4.85	0.64

immemorial. When first broken in 1941 not much response to salt, even from the most salt-responsive crops, was expected the first year of cropping. The benefits secured, as presented in Table 5, are not as outstanding as were those on the previously long-pastured College muck on which the results presented in the first four tables were secured. These results do show definite increases from salt, however, and, more important, the effects from the use of the manure salts as a source of potash are fairly comparable with those secured from the 500-pound-per-acre application of salt, applied along with the high-grade potash, and with the salt and kainite increases in the earlier studies.

Discussion

The results presented in this paper show definitely that for certain crops ordinary salt should be considered a fertilizing material. Regarding the fertilizing action of salt, the following points should be stressed:

1. The beneficial effect of sodium chloride (ordinary salt) lies wholly or largely in its sodium content.
2. The beneficial effect of sodium chloride (salt) can be secured only in the presence of a good supply of available potash. The sodium does not act as a substitute but rather as a supplement to potash.
3. Crops which have shown a very definite response to sodium chloride include celery, mangels, sugar beets, Swiss chard, table beets, and turnips. Crops which may be benefited include cabbage, celeriac, kale, kohlrabi, radishes, and rape, the amount of response depending on how much sodium chloride has been applied to the

TABLE 5.—EFFECT OF VARYING ORDINARY SALT, MURIATE OF POTASH, AND MINE-RUN POTASH APPLICATIONS TO MUCK SOIL ON YIELDS OF THREE CROPS AND SUGAR CONTENT OF SUGAR BEETS, MICHIGAN STATE COLLEGE EXPERIMENTAL FARM, 1942

Order of duplicate plots	Fertilizer application, 1942. 800 lbs. per acre	Salt application, 1942. lbs. per acre	Average yields per acre					
			Celery tons	Table beets (roots) tons	Sugar beets			
					Roots tons	% Sugar (Sucrose)	Recoverable sugar lbs.	% Purity
1, 10	0–10–30	0	14.2	18.4	13.4	14.6	3243	83.1
5	0–10–60	0	16.1	21.8	14.2	15.0	3554	83.7
4	0–10–30*	0	16.4	22.3	14.6	14.6	3556	83.7
6	0–10–30	250	16.7	21.3	14.2	14.8	3517	83.7
2, 3	0–10–30	500	15.4	23.7	15.0	14.6	3639	83.1
9	0–10–30	750	18.1	23.0	14.3	14.2	3553	82.5
7, 8	0–10–30	1000	18.3	23.5	14.6	14.6	3333	83.3

*Carrier used as source of potash on all plots except No. 4, muriate of potash (61.41 K_2O). Potash on plot 4, Carlsbad, New Mexico, manure salts (25 per cent K_2O). All salt of Michigan origin.

soil in recent years as an impurity in the potash applied.

4. Mine-run Carlsbad potash salts (manure salts), containing around 25 per cent potash, with sodium chloride as an impurity, can be effectively and economically used in the fertilization of the salt-responsive crops, even as far north as Michigan.

In this emergency, the use of manure salts should be seriously considered for the crops which respond to salt, in order to release the refined potash salts so there will be ample for other crops. The benefits which will be secured with the salt-responsive crops appear likely to occur on any soil which is low in available sodium. Cost of these mine-run salts at Carlsbad plus transportation to any locality should be balanced against the delivered charge for an equal number of units of refined potash, plus the local cost of an amount of salt equal to that in the manure salts, in order to determine the economy in the use of the mine-run potash.

An Era's End

(*From page* 5)

day of the three-year-old beef steer, the mammoth finished animal, is gone for good," said a commentary. Consumers were getting into smaller homes and doing less arduous outdoor work, and the favorite cuts were smaller and trimmer and fancier than in the brave old days of "hoof and horns" appetites. Producers were finding it easier and cheaper to finish the smaller types of steers and got a quicker turn-over, too.

When the time came that summer to move the crops into the terminals, Congress had asked the treasury to help. But the help was not the popular kind when it arrived. Secretary McAdoo stated the government would

supply fifty million dollars—then a pretty slick sum for a hand-out—but he tied some strings to it, so it wouldn't be apt to stray very far or stay out too late. He offered to loan this fund to the commission houses to plank down to producers in crop movements, provided that all the cash would be safely back inside the steel doors at Washington not later than December 10, 1913. This brought out a series of scoffs and caterwauls that seem sort of familiar today, when a sum like McAdoo offered would be chicken feed. The boys thought it was pretty slim picking those days, too, for a national backing in moving the grains. One Minneapolis commission man ended his snort of derision by saying that his firm alone borrowed ten million dollars every summer to keep the inbound wheat cars moving.

But the thing that had them all steamed up into glorified attitudes was the general theme of the season about one hundred years of continuous peace between this country and England. Farmers and everybody else listened to the racket made by stump speakers and Fourth of July orators and Sunday school philosophers. The radio was, of course, silent on this important jubilee occasion.

LADS who would in five years be heroes of Flanders Fields joined their placid elders that summer of 1913 in whooping it up for Commodore Oliver Hazard Peary, and the victory at Put-In Bay that brought the end of strife between Yankees and John Bull and ushered in a century of silent guns. Just why they celebrated a truce between these two nations and forgot the rest of the shooting that went on both here and abroad between 1813 and 1913 cannot be explained now, even if we took time for it.

Probably, it was because we were living comfortably in a sort of fools' paradise, at least that's the way the recent economists describe that era. Be that as it may, we were sure mighty happy being fools back in those days. It was awful tranquil-like and somnolent and peaceful, and the "guards" never bothered us much, even if we went too close to the outside fence.

Mostly, I remember that farmers were not so long-faced and dubious about the future, back then. If local labor was shy, folks organized a "bee" and raised the barn awhile, and raised Ned afterwards with a barrel of something. If a guy broke a machine or his crops failed last year so he couldn't get him a new patent binder, why the neighbors pitched in and hoisted him up out of his dilemma. Box socials and donation parties went on everywhere, and kids didn't need a pocketful of cash each time they rode the lumber wagon into town.

SURE, farmers got mad about conditions and voted sometimes for bewhiskered sockless radicals, and Populists were popular like any kind of a new sideshow to amuse the proletariat. But locally and internally, in the tall grass and amid the sticks, there was no over-organization, no ultra-complicated mess of belonging-to and supporting-which.

But it was the last of the Mohicans, all right. This pleasant interlude was due for a shock. During the decade after 1913 and on a little further, farmers got to imitating capitalists and thus became more class conscious. Maybe they had to, I don't know. Anyhow they got real commercial. Thereafter, it was constant attention to bookkeeping and income and outgo; whereas, in 1913 and prior thereto, only a few fellows took pride in keeping books, and mostly they were prices current and breeding fees and veterinary charges and what-not, mere memoranda.

No doubt the isolated situation of farm folks in 1913 compared to modern times contributed to their carefree, independent, zestful lives, and caused them to lay aside less for such enter-

tainment as motion pictures, bingo, and trips to the dentist.

Not that their farm journals contained nothing of a nature to make them take their financial corsets off. Plenty of advertising coaxed out the rural dollars. We can find space for only a few such items, in retrospect:

SPREADEAGLED in close-set display type we get heaps of savory suggestions about: "The new wonder 150-egg incubator to put an end to the dreary task of nursing sitting hens; Ray-Oil lamps, brass and nickel plated, to make winter bulletin reading a pleasure; free homesteads in Canada and big orchard opportunity in the Ozarks; great fields open for the man with a spare horse and wagon to sell liniment made in Winona; get your new split-hickory buggy (two years guarantee and 30 days riding for nothing); lightning rods, kodaks, and victrolas; automatic cream separators driven by magneto equipped gasoline engines; new perfected home electric light plants, and believe it or not, a few handsome horseless carriages for the farmers to get commercial feelings by driving—and then demand better roads and bigger taxes."

The ones advertised in 1913 to suspicious farmers included Krit, Cartercar, Pontiac, Case 40, and Reo 5th. The best ones boasted records of twenty thousand miles, and we had also visions of easier travel through the new asset, "no rim-cut cord tires." But the pace toward commercialism was a slow one via the motor car boom in 1913, because the cheapest models sold for $1,700. As long as you stuck to Climax plug for relaxation and rode in a Buckboard, nobody cared whether you kept books or wrote checks or had fancy farm letterheads. Being backward and easy-going wasn't stimulating to the ego, but it didn't hurt your digestion or spoil your sleep much.

However, I presume there has come in the wake of the new commercial farm-mindedness a better lease on health and longevity and a higher degree of culture and maybe a finer sense of modern values. I'm not always so dead sure about the spiritual and natural essences of rural living being very much improved along with the newer goals and gadgets.

It's true we lacked such inspiring and beneficial things as 4-H clubs and Future Farmer Chapters and study circles among the housewives, provided by extension folks. But I suppose the AAA and the FSA and the credit agencies might be disposed of as remedies and counter-irritants for something that took us unawares and made us itch and vomit between 1913 and 1933. If they can be fashioned into a preventive for ills and troublesome cycles instead of just remaining a dose of tonic, why I think we shall make some progress after all.

Anyhow we now live out and beyond the old fence lines which hemmed us in, sort of, back in 1913 and before. We were states-righters and town-planners and Americans First in those sterling times. Now we emerge from a sort of coma into a vast expanse of world dominion, and we've got to learn to love neighbors that live more than a gun shot and a holler distant from our bailiwick.

I RECKON I've been just like old Rip Van Winkle—snoozing away in a pile of dusty leaves of yesterday while the airships invented themselves into the spotlight and made us over into a come-closer community.

All I can say is, "Brothers, It's been a mighty nice thirty years of sleep for me. Seems like I've been havin' some queer disturbin' nightmares lately, and some awful frisky squirrels and jackrabbits have run across my whiskers. But if I ain't too blame old to be of service, just give me a leetle hist with my game hind-leg there and I'll give you all a real demonstration of how we used to live and let live back when the era ended—in 1913."

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Potash Pays on Grain (South)
Greater Profits from Cotton
Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Grow More Corn (South)
Fertilizing Small Fruits (Pacific Coast)
Potash Hungry Fruit Trees (Pacific Coast)
Fertilize Potatoes for Quality and Profits (Pacific Coast)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (General)
Fertilize Pastures for Better Livestock (Pacific Coast)
What You Sow This Fall (Canada)
Home-grown Grains for Profitable Hogs (Canada)
What About Clover? (Canada)
Of Course I'm Interested (Pastures, Canada)
Meet the Family (Canada)

Reprints

T-8 A Balanced Fertilizer for Bright Tobacco
CC-8 How I Control Black-spot
II-8 Balanced Fertilizers Make Fine Oranges
N-9 Problems of Feeding Cigarleaf Tobacco
T-9 Fertilizing Potatoes in New England
DD-9 Some Fundamentals of Soil Management
KK-9 Florida Studies Celery Plant-food Needs
MM-9 Fertilizing Tomatoes in Virginia
UU-9 Oregon Beets and Celery Need Boron
A-2-40 Balanced Fertilization For Apple Orchards
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
J-4-40 Potash Helps Cotton Resist Wilt, Rust, and Drought
Q-5-40 Potash Deficiency in New England
S-5-40 What Is the Matter with Your Soil?
CC-10-40 Building Better Soils
A-1-41 Better Pastures in North Alabama
E-2-41 Use Boron and Potash for Better Alfalfa
I-3-41 Soil and Plant-tissue Tests as Aids in Determining Fertilizer Needs
K-4-41 The Nutrition of Muck Crops
R-6-41 A Balanced Diet for Nursery Stock
U-8-41 The Effect of Borax on Spinach and Sugar Beets
Y-9-41 Ladino Clover Makes Good Poultry Pasture
Z-9-41 Grassland Farming in New England
BB-11-41 Why Soybeans Should Be Fertilized
EE-11-41 Cane Fruit Responds to High Potash
HH-12-41 Some Newer Ideas on Orchard Fertility
II-12-41 Plant Symptoms Show Need for Potash
B-1-42 Growing Ladino Clover in the Northeast
D-2-42 Boron Deficiency on Long Island
E-2-42 Fertilizing for More and Better Vegetables
F-2-42 Prune Trees Need Plenty of Potash
G-3-42 More Legumes for Ontario Mean More Cheese for Britain
H-3-42 Legumes Are Essential to Sound Agriculture
I-3-42 High-grade Fertilizers Are More Profitable
O-5-42 Nutritional Information from Plant Tissue Tests
P-5-42 Purpose and Function of Soil Tests
Q-5-42 Potash Extends the Life of Clover Stands
R-5-42 Legumes Will Furnish Needed Nitrogen
S-6-42 A Comparison of Boron Deficiency Symptoms and Potash Leafhopper Injury on Alfalfa
T-6-42 The Fertilization of Pastures and Legumes
V-6-42 Some Soil Problems of the Piedmont
X-8-42 Conserve Nitrogen Now
Y-8-42 The Southeast Can Grow Clover and Alfalfa
Z-8-42 The One-Mule Farmer Needs a New Machine
AA-10-42 Growing Legumes for Nitrogen
BB-10-42 Insuring Success With Indiana Sweets
CC-10-42 Managing Mucks Includes Control of Blowing
DD-10-42 Clover Pastures for the Coastal Plains
EE-11-42 Lespedeza Pastures for Florida
FF-11-42 Boron in Agriculture
GG-11-42 Some Experiences in Applying Fertilizer
HH-11-42 The Nutrition of the Corn Plant
II-12-42 Wartime Contribution of the American Potash Industry
JJ-12-42 The Place of Boron in Growing Truck
A-1-43 The Salt That Nearly Lost a War
B-1-43 Crotalaria—A Crop That Grows Like Weeds
C-1-43 Quality in Grasses for Pasture and Hay
D-1-43 For Hershey Orchards—Complete Fertilizer
E-1-43 Borax for Alfalfa in Tennessee
F-1-43 Boron Improves Canning Beets
G-1-43 Plow-Sole Fertilizers Make Good Showing
H-2-43 Plant Food for Peach Profits
I-2-43 Building Terraces With Slip Scrapes
J-2-43 Maintaining Fertility When Growing Peanuts
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U-4-43 Potassium-Boron Relations in Plants
V-4-43 Permanent Pastures Need Help
W-4-43 The Soil Is the Basis of Farming Business

THE AMERICAN POTASH INSTITUTE
1155 16TH STREET, N. W. WASHINGTON 6, D. C.

A North Carolina rationing board reports that one of the mountain farmers living nearby has just about found a limit to his patriotism.

"I'm trying to do my bit, patriotic-like," said the farmer, who had sworn that he and his family would abide by sugar rationing regulations, "but I'm married, have eight children, and I'm derned if I can afford to keep on a-buyin' all that sugar."

A sweet young thing grabbed a taxi downtown the other day and said to the driver, "To the maternity hospital and never mind rushing, I only work there."

Lawyer: "You mean to imply that Mandy then cut his acquaintance?"

Witness: "Wusser dan dat, suh! She cut his throat."

Paul: "Do you ever think of the good old days before we had rationing?"

Arch: "Yes."

Paul: "Do you think there is much difference now?"

Arch: "Yes, we used to step on the gas and sit, and now we sit on the steps and gas."

"Bill shouldn't have married Irene. In six months' time she's made him a pauper."

"Wow! Is it a boy or girl?"

1913: Supply and demand.

1943: Supply or be damned.

PERHAPS

Englishman: "I say, what are they doing?"

American: "They're dancing."

Englishman: "They get married later, don't they?"

"Brown never completed his education, did he?"

"No, he lived and died a bachelor."

Two little mites of about six and seven respectively were gazing with considerable interest at the storks in the zoo, when the usual interfering old lady ambled up.

"Those are storks, my dears," she purred. "The clever birds that brought you to your mother and father!"

The youngsters looked at one another, and one whispered: "Poor old thing! Shall we tell her?"

Sex, like automobiles and everything else, has been so streamlined and glamorized, that some old fellows wish they could start all over again.

Girlie: "Do you believe in love at first sight?"

Sailor: "I gotta. I only got two days leave."

"Prejudice is a great time saver—it enables one to form opinions without bothering to get the facts."

Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

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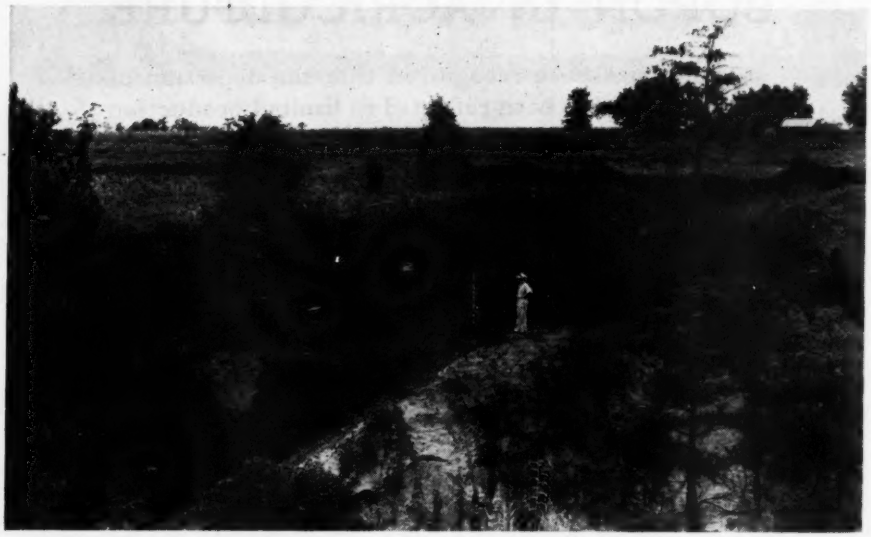

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A 16mm., sound, color film depicting the early South, the results of the one-crop system, and the reclamation and conservation of Southern soils through the use of legumes and modern methods of soil management. *Running time, 28 min. (on 1200-ft. reel).*

Other 16MM. COLOR FILMS AVAILABLE

Potash in Southern Agriculture
In the Clover
Bringing Citrus Quality to Market
Machine Placement of Fertilizer
Ladino Clover Pastures
Potash from Soil to Plant
Potash Deficiency in Grapes and Prunes
New Soils from Old
Potash Production in America

We shall be pleased to loan any of these films to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible) and period of time of loan.

For additional information write:

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POTASH IN NORTH AMERICA

By J. W. TURRENTINE

President American Potash Institute

AMERICAN CHEMICAL SOCIETY MONOGRAPH NO. 91

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AMONG American chemical industries that have attracted national and international attention due to their war-emergency performance, few have exceeded the American potash industry.

This interesting and well-written survey of the development of the American potash industry during the last fifteen years is particularly important at the present time, when the food problem is second in importance only to the war itself. After a brief review of the present sources of potash, complete details are given as to production, both domestic and foreign; present status of the industry; and its future prospects. Special attention is accorded to Carlsbad, N. M., and Searles Lake, Calif., developments, and to the fundamental technology of potash. This important volume has been made unusually attractive by the inclusion of a large number of exceptionally good photographs of all phases of the industry.

Dr. Turrentine, of the American Potash Institute, is one of the country's leading authorities in this field. His work will be welcomed as a most significant addition to the literature of the subject by all who are interested in any way in the production and use of potash and related products. This book will be required by public libraries, as it is the only source of reliable information on the current status of this vital resource.

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CHAPTERS

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Technology of Potash Production
Conclusion

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